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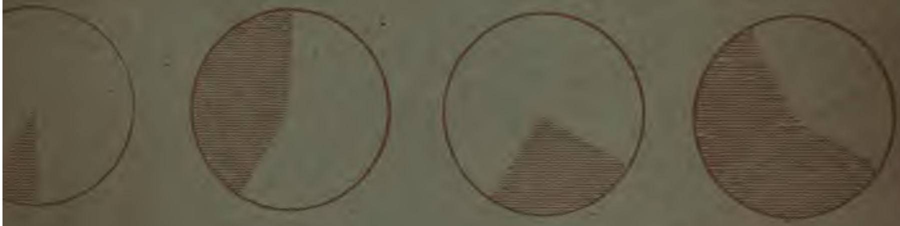

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FRACTIONS.

A TEACHERS' MANUAL
OF
OBJECTIVE AND ORAL WORK.

BY

HELEN F. PAGE,
STATE NORMAL AND TRAINING SCHOOL, NEW BRITAIN, CONN.

BOSTON, U.S.A.:
GINN & COMPANY, PUBLISHERS.
1891.

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Typography by J. S. Cushing & Co., Boston, U.S.A.

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FRACTIONS.

REDUCTION, ADDITION, AND SUBTRACTION.

I. First set: halves, fourths, and eighths.

1. OBJECTIVE WORK.

(*a*) *With card-board disks.*

(Each child has a pair of scissors, and two disks divided by a light pencil-mark into eighths.)

Teacher. Cut one disk into halves.
Show me a half.
How many halves have you?
Cut one-half into two equal parts.
What part of the disk is one of these pieces?
Show as many fourths as you can (in one disk).
Tell something about one-half.
What is the best name for $\frac{2}{4}$?
Show $\frac{3}{4}$. What can you find in it?
Show $\frac{1}{2}$. Put with it $\frac{3}{4}$. What have you?
Show $\frac{1}{2}$. Take away $\frac{1}{4}$. What have you left?
Show $\frac{3}{4}$. Take away $\frac{1}{2}$. What is left?
Show $\frac{1}{4}$. Show $\frac{1}{2}$ of it. What part of the whole disk have you?
Show as many eighths as you can find (in one disk).
Show $\frac{1}{2}$. Tell what you can about $\frac{1}{2}$ and eighths; $\frac{1}{4}$ and eighths; $\frac{3}{4}$ and eighths.
Show $\frac{2}{8}$. What is a better name?
Show $\frac{4}{8}$. What is a better name?
Show $\frac{6}{8}$. What is a better name?
Show $\frac{3}{8}$. What can you find in it? In $\frac{5}{8}$? In $\frac{7}{8}$?

Take $\frac{1}{2}$. Put with it $\frac{1}{8}$. What have you now ?

Take $\frac{1}{2}$. Put with it $\frac{3}{8}$. What have you ?

Put $\frac{5}{8}$ with $\frac{1}{2}$. What have you ?

Put $\frac{7}{8}$ with $\frac{1}{2}$. What have you ?

Show $\frac{1}{4}$. Put with it $\frac{1}{8}$. What is the sum ?

Put $\frac{3}{8}$ with $\frac{1}{4}$. What have you ?

$\frac{5}{8}$ and $\frac{1}{4} = ?$ $\frac{7}{8}$ and $\frac{1}{4} = ?$

Show $\frac{3}{4}$. Put with it $\frac{1}{8}$. What is the sum ?

$\frac{3}{4}$ and $\frac{3}{8} = ?$ $\frac{3}{4}$ and $\frac{5}{8} = ?$ $\frac{3}{4}$ and $\frac{7}{8} = ?$

Show $\frac{1}{2}$. Take away $\frac{1}{8}$. What is left ?

Take away $\frac{3}{8}$ from $\frac{1}{2}$. What remains ?

Show $\frac{1}{4}$. Take away $\frac{1}{8}$. What remains ?

Show $\frac{3}{4}$. Remove $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$. What remains in each case ?

From $\frac{3}{8}$ take $\frac{1}{4}$. What is left ?

From $\frac{5}{8}$ take $\frac{1}{2}$. What is left ?

$\frac{5}{8} - \frac{1}{4} = ?$ $\frac{7}{8} - \frac{1}{2} = ?$ $\frac{7}{8} - \frac{1}{4} = ?$ $\frac{7}{8} - \frac{3}{4} = ?$

Note. The card-board disks have been suggested for this work because they are cheap and easily provided. It would be unwise, though, to confine one's self to any one object.

(*b*) *With denominate numbers.*

1) Measure $\frac{1}{2}$ peck of corn. Put with it one quart. What part of a peck have you ?
2) Measure $\frac{7}{8}$ bushel. Remove $1\frac{1}{2}$ pecks. What part of a bushel have you ?
3) With 3 quarts put $\frac{1}{4}$ peck. What part of a peck have you now ?
4) Show 7 quarts. Remove $\frac{1}{2}$ peck. How many quarts are left ?
5) Measure $\frac{1}{2}$ bushel. Remove $\frac{1}{4}$ bushel. How many pecks are left ? How many quarts ?
6) With $\frac{3}{4}$ peck put 3 quarts. Add $\frac{3}{8}$ peck. Add $\frac{1}{2}$ peck. What part of a bushel have you ?
7) Measure 7 quarts. Remove $\frac{3}{8}$ peck. What part of a peck is left ?

8) Measure 15 pints. Remove $\frac{1}{2}$ peck. Remove $\frac{1}{8}$ peck. What is left?
9) With $\frac{3}{8}$ bushel put $\frac{3}{8}$ peck. How many quarts have you?
10) Measure $\frac{1}{2}$ gallon of water. Put with it $\frac{1}{2}$ quart. How many pints have you?
11) Measure $\frac{5}{8}$ gallon. Take out 2 quarts. What part of a gallon is left?
12) With $\frac{3}{4}$ gallon put $2\frac{1}{2}$ quarts. How many gallons have you?
13) Measure $\frac{1}{2}$ quart and $\frac{1}{2}$ gallon. What part of a gallon have you?
14) Measure 3 quarts. Remove $\frac{3}{8}$ gallon. What is left?
15) Measure 5 quarts. Remove $\frac{1}{4}$ gallon. Remove $\frac{3}{8}$ gallon. What is left?
16) Measure $\frac{7}{8}$ gallon. Remove 5 pints. What part of a gallon remains?
17) Measure $\frac{1}{2}$ gallon, $\frac{1}{2}$ quart, and $\frac{3}{8}$ gallon. What quantity have you?

2. PICTURE WORK.

(*a*) *Recognition of parts.*

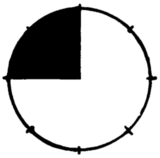
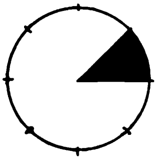
Select each fractional part from among the pictures on the blackboard of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{7}{8}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{8}$.

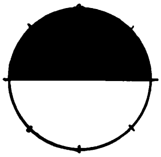
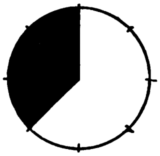
(*b*) *Drawing of parts.*

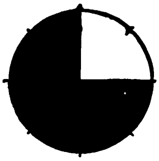
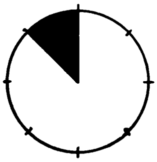
Draw on the blackboard, or on paper, as accurately as possible, $\frac{3}{8}$, $\frac{1}{4}$, $\frac{7}{8}$, $\frac{5}{8}$, $\frac{1}{8}$, $\frac{3}{4}$, $\frac{1}{2}$.

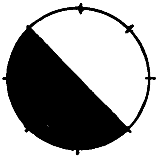
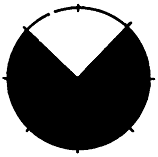
(*c*) *Reading from pictures of facts.*

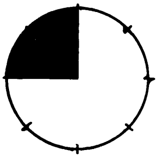
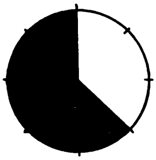
(These figures may be drawn on the blackboard, perhaps by the children themselves, before the lesson time. Then during the recitation the questions are to be read, and the answers expressed by drawings or figures, or simply stated.)

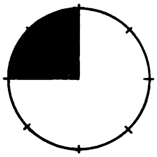
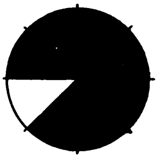
1.  +  = ?

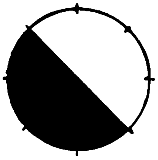
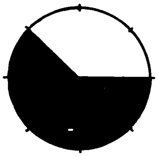
2.  +  = ?

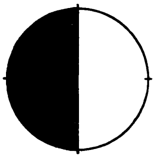
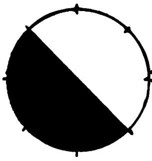
3.  +  = ?

4.  +  = ?

5.  +  = ?

6.  +  = ?

7.  +  = ?

8.  +  = ?

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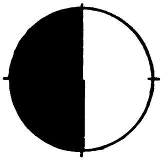
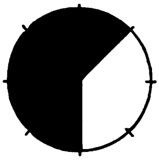


$\frac{1}{?} - \frac{1}{?} = ?$

26.



$\frac{5}{?} - \frac{1}{2} = ?$

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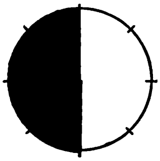

$\frac{1}{?} - \frac{3}{?} = ?$

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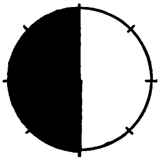

$\frac{7}{?} - \frac{3}{?} = ?$

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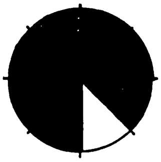

$\frac{7}{?} - \frac{3}{?} = ?$

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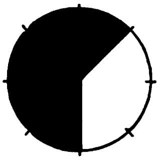

$\frac{1}{?} - \frac{1}{?} = ?$

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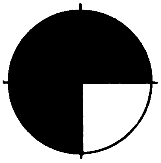

$\frac{3}{?} - \frac{1}{2} = ?$

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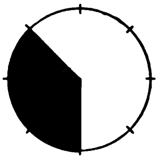

$\frac{3}{?} - \frac{1}{4} = ?$

(*d*) *Drawing pictures of facts.*

Draw pictures on the blackboard, or on paper, to represent these questions and their answers:

$\frac{1}{2}+\frac{1}{4}=?$ $\frac{1}{2}-\frac{1}{4}=?$

$\frac{1}{2}+\frac{3}{4}=?$ $\frac{1}{2}-\frac{1}{8}=?$

$\frac{1}{2}+\frac{1}{8}=?$ $\frac{1}{2}-\frac{3}{8}=?$

$\frac{1}{2}+\frac{3}{8}=?$ $\frac{1}{4}-\frac{1}{8}=?$

etc.   etc.

3. MENTAL DRILL IN DENOMINATE NUMBERS.

1) $\frac{1}{2}$ gallon and $\frac{1}{4}$ gallon are what part of a gallon? How many quarts?
2) $\frac{5}{8}$ gallon less $\frac{1}{2}$ gallon is what part of a gallon? How many pints?
3) $\frac{1}{2}$ bushel less $\frac{1}{2}$ peck is what part of a bushel?
4) $\frac{7}{8}$ bushel less 2 pecks is what part of a bushel?
5) $\frac{1}{4}$ peck and $\frac{3}{8}$ peck are what part of a peck? How many quarts?
6) $\frac{5}{8}$ peck less $\frac{1}{8}$ bushel is what part of a peck?
7) $\frac{1}{4}$ bushel and $\frac{7}{8}$ bushel are how many bushels? How many pecks?
8) $\frac{3}{4}$ bushel and $\frac{5}{8}$ bushel are how many bushels? How many pecks?
9) From $\frac{5}{8}$ gallon take $\frac{1}{4}$ gallon. What part of a gallon is left? How many pints?
10) Add $\frac{1}{2}$ quart and $\frac{3}{8}$ gallon.
11) Add $\frac{1}{2}$ foot and $\frac{3}{4}$ foot. How many inches?
12) From $\frac{5}{8}$ foot take $\frac{1}{2}$ foot. What part of a foot is left? How many inches?
13) Add $\frac{1}{2}$ foot, $\frac{1}{4}$ foot, 6 inches, and $\frac{3}{4}$ foot. How many feet?

4. ABSTRACT DRILL.

Think of $\frac{1}{2}$ of some thing. Think of $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$ of the same thing.

$\frac{1}{2}$ is how many fourths?

What is there in $\frac{3}{4}$?

$\frac{1}{2}+\frac{1}{4}=?$
$\frac{1}{2}+\frac{3}{4}=?$
$\frac{1}{2}-\frac{1}{4}=?$
$\frac{3}{4}-\frac{1}{2}=?$
$\frac{3}{4}-\frac{1}{4}=?$

$\frac{1}{2}$ is how many eighths?
$\frac{1}{4}$ is how many eighths?
$\frac{3}{4}$ is how many eighths?
Give another name for $\frac{4}{8}$; $\frac{2}{8}$; $\frac{6}{8}$.
What is there in $\frac{3}{8}$? In $\frac{5}{8}$? In $\frac{7}{8}$?

$\frac{1}{2}+\frac{1}{8}=?$
$\frac{1}{2}+\frac{3}{8}=?$
$\frac{1}{2}+\frac{5}{8}=?$
$\frac{1}{2}+\frac{7}{8}=?$
$\frac{1}{4}+\frac{1}{8}=?$
$\frac{1}{4}+\frac{3}{8}=?$

$\frac{1}{4}+\frac{5}{8}=?$
$\frac{1}{4}+\frac{7}{8}=?$
$\frac{3}{4}+\frac{1}{8}=?$
$\frac{3}{4}+\frac{3}{8}=?$
$\frac{3}{4}+\frac{5}{8}=?$
$\frac{3}{4}+\frac{7}{8}=?$

$\frac{1}{2}-\frac{1}{8}=?$
$\frac{1}{2}-\frac{3}{8}=?$
$\frac{1}{4}-\frac{1}{8}=?$
$\frac{3}{4}-\frac{1}{8}=?$
$\frac{3}{4}-\frac{3}{8}=?$
$\frac{3}{4}-\frac{5}{8}=?$

$\frac{3}{8}-\frac{1}{4}=?$
$\frac{5}{8}-\frac{1}{2}=?$
$\frac{5}{8}-\frac{1}{4}=?$
$\frac{7}{8}-\frac{1}{2}=?$
$\frac{7}{8}-\frac{3}{4}=?$

5. PROBLEMS.

1) I had $\frac{7}{8}$ of a pound of chocolates. I ate $\frac{1}{4}$ pound. What part of a pound had I left?
2) From a bin containing $5\frac{5}{8}$ bushels of corn, $3\frac{1}{4}$ bushels were removed at one time, and $1\frac{1}{2}$ bushels at another time. How much remained?
3) Under one tree is $\frac{1}{2}$ bushel of apples, $\frac{5}{16}$ bushel under another, $\frac{3}{8}$ bushel under a third tree. How many apples are under all three trees?
4) John lives $\frac{5}{8}$ mile east of the school-house in a straight line; Mary lives $\frac{3}{4}$ of a mile west in a straight line. How far is it from Mary's house to John's?
5) Henry Adams has $5\frac{3}{4}$ acres of land in one field, $10\frac{5}{8}$ acres in another. How much land has he in both fields?
6) Frank lives $\frac{11}{16}$ mile directly north of the church, Henry lives $\frac{3}{8}$ mile directly north. What is the distance from Frank's house to Henry's?
7) Fred drives $5\frac{3}{4}$ miles on Monday, $3\frac{3}{8}$ miles on Tues-

day, $6\frac{1}{2}$ miles on Wednesday. How far does he drive on all three days?

8) A railroad conductor spends $\frac{3}{8}$ of his time on the train, $\frac{5}{16}$ eating his meals, and the remainder in rest. What part of his time does he spend in resting?

9) $\frac{5}{8}$ of a quart of chestnuts were picked up under one tree, $\frac{1}{2}$ quart under another. How many chestnuts were gathered?

10) $\frac{3}{4}$ of a pint of marbles were sold in a store in the morning and $\frac{7}{8}$ of a pint in the afternoon. How many marbles were sold during the day?

11) I bought a yard of velvet for \$$1\frac{1}{4}$ and some cotton cloth at the rate of $\frac{1}{8}$ of a dollar per yard. What did the velvet and 3 yards of cotton cloth cost?

12) A boy spent $\frac{7}{16}$ of his money and gave away $\frac{1}{4}$ of it. What part had he left?

13) A man who owned $\frac{1}{2}$ of a mill sold $\frac{1}{4}$ of the mill. If the mill were worth \$1200, what would be the value of the part that the man still owned?

14) One man works at the rate of \$$4\frac{1}{2}$ per day, and another at the rate of \$$3\frac{1}{3}$. How much more than the second does the first earn daily?

15) One watch gains $\frac{5}{8}$ of a minute per day, and another gains $\frac{7}{16}$ of a minute. How much more does one gain than the other?

16) In preparing a dinner the cook used $\frac{1}{16}$ pound of butter in the potato, $\frac{1}{4}$ pound in the pudding, and $\frac{1}{8}$ pound on the toast. How much butter did she use?

Note 1. Problems involving sixteenths should not be used until after the objective work with sixteenths has been done.

Note 2. The problems have been graded carefully, so that nearly all in one collection bring in the same process and the same fractional parts. To guard against thoughtless solution by the children, the teacher should introduce occasionally problems to be solved by some other process.

6. SEAT WORK.

1) Use the color-diagram pamphlet.[1]
2) Draw pictures on slates or paper to represent all the facts that you can think of about halves, fourths, and eighths.
3) Write the figures for facts that you see pictured on the blackboard.
4) Make a problem about each of the first four picture-facts on the blackboard.
5) Make four problems about pies, potatoes, sheets of paper, watermelons, etc., using halves, fourths, or eighths in each. Make pictures of the parts used.

Later introduce sixteenths. Use them in objective, pictorial and abstract work as halves, fourths, and eighths have been used.

Order of facts.

$\frac{1}{2} = \frac{8}{16}$
$\frac{1}{4} = \frac{4}{16}$
$\frac{3}{4} = \frac{12}{16}$
$\frac{1}{8} = \frac{2}{16}$
$\frac{3}{8} = \frac{6}{16}$
$\frac{5}{8} = \frac{10}{16}$
$\frac{7}{8} = \frac{14}{16}$
In $\frac{3}{16} = \frac{1}{8} + \frac{1}{16}$
In $\frac{5}{16} = \frac{1}{4} + \frac{1}{16}$
In $\frac{5}{16} = \frac{1}{8} + \frac{3}{16}$
In $\frac{7}{16} = \frac{3}{8} + \frac{1}{16}$

In $\frac{7}{16} = \frac{1}{4} + \frac{3}{16}$
In $\frac{9}{16} = \frac{1}{2} + \frac{1}{16}$
In $\frac{9}{16} = \frac{3}{8} + \frac{3}{16}$
In $\frac{9}{16} = \frac{1}{4} + \frac{5}{16}$
In $\frac{11}{16} = \frac{1}{2} + \frac{3}{16}$
In $\frac{11}{16} = \frac{5}{8} + \frac{1}{16}$
In $\frac{11}{16} = \frac{1}{4} + \frac{7}{16}$
In $\frac{11}{16} = \frac{5}{8} + \frac{1}{16}$
In $\frac{13}{16} = \frac{1}{2} + \frac{5}{16}$
In $\frac{13}{16} = \frac{5}{8} + \frac{3}{16}$
In $\frac{13}{16} = \frac{3}{4} + \frac{1}{16}$

In $\frac{15}{16} = \frac{1}{2} + \frac{7}{16}$
In $\frac{15}{16} = \frac{3}{4} + \frac{3}{16}$
In $\frac{15}{16} = \frac{7}{8} + \frac{1}{16}$
$\frac{1}{2} + \frac{1}{16} =$
$\frac{1}{2} + \frac{3}{16} =$
$\frac{1}{2} + \frac{5}{16} =$
$\frac{1}{2} + \frac{7}{16} =$
$\frac{1}{2} + \frac{9}{16} =$
etc.
$\frac{1}{4} + \frac{1}{16} =$
etc.

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[1] A pamphlet of color-diagrams for private study or seat work is published by Ginn & Company. All processes with fractions are illustrated.

Fractions: Color Diagrams for use in connection with the Teachers' Manual. By H. F. Page.

$\frac{3}{4} + \frac{1}{16} =$
etc.
$\frac{1}{8} + \frac{1}{16} =$
etc.
$\frac{3}{8} + \frac{1}{16} =$
etc.
$\frac{5}{8} + \frac{1}{16} =$
etc.
$\frac{7}{8} + \frac{1}{16} =$
etc.

$\frac{1}{2} - \frac{1}{16} =$
$\frac{1}{2} - \frac{3}{16} =$
$\frac{1}{2} - \frac{5}{16} =$
$\frac{1}{2} - \frac{7}{16} =$
$\frac{1}{4} - \frac{1}{16} =$
$\frac{1}{4} - \frac{3}{16} =$
$\frac{3}{4} - \frac{1}{16} =$
etc.

$\frac{1}{8} - \frac{1}{16} =$
$\frac{3}{8} - \frac{1}{16} =$
$\frac{3}{8} - \frac{3}{16} =$
$\frac{3}{8} - \frac{5}{16} =$
$\frac{5}{8} - \frac{1}{16} =$
etc.
$\frac{7}{8} - \frac{1}{16} =$
etc.

II. Halves, thirds, sixths, and twelfths.

1. OBJECTIVE WORK.

(*a*) *Illustrate with disks* (*as before*) *these facts.*

$\frac{1}{2} = \frac{3}{6}$
$\frac{1}{3} = \frac{2}{6}$
$\frac{2}{3} = \frac{4}{6}$
In $\frac{5}{6} = \frac{1}{2} + \frac{1}{3}$
In $\frac{5}{6} = \frac{2}{3} + \frac{1}{6}$

$\frac{1}{2} + \frac{1}{3} =$
$\frac{1}{2} + \frac{2}{3} =$
$\frac{1}{2} + \frac{1}{6} =$
$\frac{1}{2} + \frac{5}{6} =$
$\frac{1}{3} + \frac{1}{6} =$
$\frac{1}{3} + \frac{5}{6} =$
$\frac{2}{3} + \frac{1}{6} =$
$\frac{2}{3} + \frac{5}{6} =$

$\frac{1}{2} - \frac{1}{3} =$
$\frac{1}{2} - \frac{1}{6} =$
$\frac{1}{3} - \frac{1}{6} =$

$\frac{2}{3} - \frac{1}{2} =$
$\frac{2}{3} - \frac{1}{6} =$
$\frac{5}{6} - \frac{1}{2} =$
$\frac{5}{6} - \frac{1}{3} =$
$\frac{5}{6} - \frac{2}{3} =$
$\frac{5}{6} - \frac{1}{6} =$
$\frac{1}{2} = \frac{6}{12}$
$\frac{1}{3} = \frac{4}{12}$
$\frac{2}{3} = \frac{8}{12}$
$\frac{1}{6} = \frac{2}{12}$
$\frac{5}{6} = \frac{10}{12}$

In $\frac{3}{12} = \frac{1}{6} + \frac{1}{12}$
In $\frac{5}{12} = \frac{1}{3} + \frac{1}{12}$
In $\frac{5}{12} = \frac{1}{4} + \frac{1}{6}$
In $\frac{7}{12} = \frac{1}{2} + \frac{1}{12}$
In $\frac{7}{12} = \frac{1}{4} + \frac{1}{3}$
In $\frac{7}{12} = \frac{1}{6} + \frac{5}{12}$

In $\frac{9}{12} = \frac{1}{2} + \frac{1}{4}$
In $\frac{9}{12} = \frac{2}{3} + \frac{1}{12}$
In $\frac{9}{12} = \frac{1}{6} + \frac{7}{12}$
In $\frac{11}{12} = \frac{1}{2} + \frac{5}{12}$
In $\frac{11}{12} = \frac{2}{3} + \frac{1}{4}$
In $\frac{11}{12} = \frac{3}{4} + \frac{1}{6}$
In $\frac{11}{12} = \frac{5}{6} + \frac{1}{12}$

$\frac{1}{2} + \frac{1}{12} =$
$\frac{1}{2} + \frac{5}{12} =$
$\frac{1}{2} + \frac{7}{12} =$
$\frac{1}{2} + \frac{11}{12} =$

$\frac{1}{4} + \frac{1}{12} =$
$\frac{1}{4} + \frac{5}{12} =$
$\frac{1}{4} + \frac{7}{12} =$
$\frac{1}{4} + \frac{11}{12} =$
$\frac{3}{4} + \frac{1}{12} =$

$\frac{3}{4}+\frac{5}{12}=$

$\frac{3}{4}+\frac{7}{12}=$

$\frac{3}{4}+\frac{11}{12}=$

◆

$\frac{1}{3}+\frac{1}{12}=$

etc.

$\frac{2}{3}+\frac{1}{12}=$

etc.

◆

$\frac{1}{6}+\frac{1}{12}=$

etc.

◆

$\frac{5}{6}+\frac{1}{12}=$

etc.

◆

$\frac{1}{2}-\frac{1}{12}=$

$\frac{1}{2}-\frac{5}{12}=$

◆

$\frac{1}{4}-\frac{1}{12}=$

$\frac{3}{4}-\frac{1}{12}=$

$\frac{3}{4}-\frac{5}{12}=$

$\frac{3}{4}-\frac{7}{12}=$

◆

$\frac{1}{3}-\frac{1}{12}=$

etc.

$\frac{2}{3}-\frac{1}{12}=$

$\frac{2}{3}-\frac{5}{12}=$

$\frac{2}{3}-\frac{7}{12}=$

◆

$\frac{1}{6}-\frac{1}{12}=$

$\frac{5}{6}-\frac{1}{12}=$

$\frac{5}{6}-\frac{5}{12}=$

$\frac{5}{6}-\frac{7}{12}=$

◆

$\frac{5}{12}-\frac{1}{3}=$

$\frac{5}{12}-\frac{1}{4}=$

$\frac{5}{12}-\frac{1}{6}=$

$\frac{5}{12}-\frac{1}{12}=$

$\frac{7}{12}-\frac{1}{3}=$

$\frac{7}{12}-\frac{1}{4}=$

$\frac{7}{12}-\frac{1}{6}=$

$\frac{11}{12}-\frac{1}{2}=$

$\frac{11}{12}-\frac{1}{3}=$

$\frac{11}{12}-\frac{2}{3}=$

$\frac{11}{12}-\frac{1}{4}=$

$\frac{11}{12}-\frac{3}{4}=$

$\frac{11}{12}-\frac{1}{6}=$

$\frac{11}{12}-\frac{5}{6}=$

(*b*) *Denominate numbers.*

1) Measure $\frac{5}{6}$ foot of ribbon. Put with it $\frac{1}{3}$ foot. How many feet have you now? How many inches?
2) Measure $\frac{11}{12}$ foot. Put with it $\frac{2}{3}$ foot. How many feet? How many inches?
3) Measure $\frac{1}{2}$ foot of string. Cut off $\frac{1}{3}$ foot. What part of a foot is left?
4) Measure $\frac{7}{12}$ of a foot. Cut off $\frac{1}{4}$ foot. Cut off $\frac{1}{4}$ foot. What remains?
5) Measure $\frac{1}{2}$ foot. Put with it $\frac{1}{3}$ foot and $\frac{5}{12}$ foot. How many inches have you?
6) Measure $\frac{5}{6}$ yard. Put with it $\frac{1}{3}$ yard and $1\frac{1}{2}$ feet. How many yards have you?
7) Measure $\frac{5}{12}$ yard. Cut from it $\frac{1}{3}$ yard. What part of a yard is left? What number of inches?

2. PICTURE WORK.

(*a*) ***Read from these pictures.***

$\frac{3}{4} + \frac{1}{16} =$
etc.
$\frac{1}{8} + \frac{1}{16} =$
etc.
$\frac{3}{8} + \frac{1}{16} =$
etc.
$\frac{5}{8} + \frac{1}{16} =$
etc.
$\frac{7}{8} + \frac{1}{16} =$
etc.

$\frac{1}{2} - \frac{1}{16} =$
$\frac{1}{2} - \frac{3}{16} =$
$\frac{1}{2} - \frac{5}{16} =$
$\frac{1}{2} - \frac{7}{16} =$
$\frac{1}{4} - \frac{1}{16} =$
$\frac{1}{4} - \frac{3}{16} =$
$\frac{3}{4} - \frac{1}{16} =$
etc.

$\frac{1}{8} - \frac{1}{16} =$
$\frac{3}{8} - \frac{1}{16} =$
$\frac{3}{8} - \frac{3}{16} =$
$\frac{3}{8} - \frac{5}{16} =$
$\frac{5}{8} - \frac{1}{16} =$
etc.
$\frac{7}{8} - \frac{1}{16} =$
etc.

II. Halves, thirds, sixths, and twelfths.

1. OBJECTIVE WORK.

(*a*) *Illustrate with disks (as before) these facts.*

$\frac{1}{2} = \frac{3}{6}$
$\frac{1}{3} = \frac{2}{6}$
$\frac{2}{3} = \frac{4}{6}$
In $\frac{5}{6} = \frac{1}{2} + \frac{1}{3}$
In $\frac{5}{6} = \frac{2}{3} + \frac{1}{6}$

◆

$\frac{1}{2} + \frac{1}{3} =$
$\frac{1}{2} + \frac{2}{3} =$
$\frac{1}{2} + \frac{1}{6} =$
$\frac{1}{2} + \frac{5}{6} =$
$\frac{1}{3} + \frac{1}{6} =$
$\frac{1}{3} + \frac{5}{6} =$
$\frac{2}{3} + \frac{1}{6} =$
$\frac{2}{3} + \frac{5}{6} =$

◆

$\frac{1}{2} - \frac{1}{3} =$
$\frac{1}{2} - \frac{1}{6} =$
$\frac{1}{3} - \frac{1}{6} =$

$\frac{2}{3} - \frac{1}{2} =$
$\frac{2}{3} - \frac{1}{6} =$
$\frac{5}{6} - \frac{1}{2} =$
$\frac{5}{6} - \frac{1}{3} =$
$\frac{5}{6} - \frac{2}{3} =$
$\frac{5}{6} - \frac{1}{6} =$
$\frac{1}{2} = \frac{6}{12}$
$\frac{1}{3} = \frac{4}{12}$
$\frac{2}{3} = \frac{8}{12}$
$\frac{1}{6} = \frac{2}{12}$
$\frac{5}{6} = \frac{10}{12}$

◆

In $\frac{3}{12} = \frac{1}{6} + \frac{1}{12}$
In $\frac{5}{12} = \frac{1}{3} + \frac{1}{12}$
In $\frac{5}{12} = \frac{1}{4} + \frac{1}{6}$
In $\frac{7}{12} = \frac{1}{2} + \frac{1}{12}$
In $\frac{7}{12} = \frac{1}{4} + \frac{1}{3}$
In $\frac{7}{12} = \frac{1}{6} + \frac{5}{12}$

In $\frac{9}{12} = \frac{1}{2} + \frac{1}{4}$
In $\frac{9}{12} = \frac{2}{3} + \frac{1}{12}$
In $\frac{9}{12} = \frac{1}{6} + \frac{7}{12}$
In $\frac{11}{12} = \frac{1}{2} + \frac{5}{12}$
In $\frac{11}{12} = \frac{2}{3} + \frac{1}{4}$
In $\frac{11}{12} = \frac{3}{4} + \frac{1}{6}$
In $\frac{11}{12} = \frac{5}{6} + \frac{1}{12}$

◆

$\frac{1}{2} + \frac{1}{12} =$
$\frac{1}{2} + \frac{5}{12} =$
$\frac{1}{2} + \frac{7}{12} =$
$\frac{1}{2} + \frac{11}{12} =$

◆

$\frac{1}{4} + \frac{1}{12} =$
$\frac{1}{4} + \frac{5}{12} =$
$\frac{1}{4} + \frac{7}{12} =$
$\frac{1}{4} + \frac{11}{12} =$
$\frac{3}{4} + \frac{1}{12} =$

$\frac{3}{4}+\frac{5}{12}=$
$\frac{3}{4}+\frac{7}{12}=$
$\frac{3}{4}+\frac{11}{12}=$

* * *

$\frac{1}{3}+\frac{1}{12}=$
etc.
$\frac{2}{3}+\frac{1}{12}=$
etc.

* * *

$\frac{1}{6}+\frac{1}{12}=$
etc.

* * *

$\frac{5}{6}+\frac{1}{12}=$
etc.

* * *

$\frac{1}{2}-\frac{1}{12}=$
$\frac{1}{2}-\frac{5}{12}=$

* * *

$\frac{1}{4}-\frac{1}{12}=$
$\frac{3}{4}-\frac{1}{12}=$
$\frac{3}{4}-\frac{5}{12}=$
$\frac{3}{4}-\frac{7}{12}=$

* * *

$\frac{1}{3}-\frac{1}{12}=$
etc.
$\frac{2}{3}-\frac{1}{12}=$
$\frac{2}{3}-\frac{5}{12}=$
$\frac{2}{3}-\frac{7}{12}=$

* * *

$\frac{1}{6}-\frac{1}{12}=$
$\frac{5}{6}-\frac{1}{12}=$
$\frac{5}{6}-\frac{5}{12}=$
$\frac{5}{6}-\frac{7}{12}=$

* * *

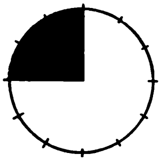
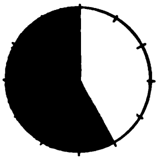
$\frac{5}{12}-\frac{1}{3}=$
$\frac{5}{12}-\frac{1}{4}=$
$\frac{5}{12}-\frac{1}{6}=$
$\frac{5}{12}-\frac{1}{12}=$
$\frac{7}{12}-\frac{1}{3}=$
$\frac{7}{12}-\frac{1}{4}=$
$\frac{7}{12}-\frac{1}{6}=$
$\frac{11}{12}-\frac{1}{2}=$
$\frac{11}{12}-\frac{1}{3}=$
$\frac{11}{12}-\frac{2}{3}=$
$\frac{11}{12}-\frac{1}{4}=$
$\frac{11}{12}-\frac{3}{4}=$
$\frac{11}{12}-\frac{1}{6}=$
$\frac{11}{12}-\frac{5}{6}=$

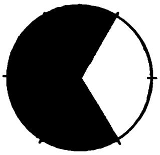
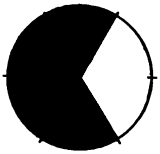
(*b*) *Denominate numbers.*

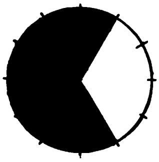
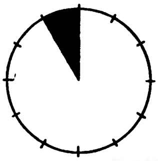
1) Measure $\frac{5}{6}$ foot of ribbon. Put with it $\frac{1}{3}$ foot. How many feet have you now? How many inches?
2) Measure $\frac{11}{12}$ foot. Put with it $\frac{2}{3}$ foot. How many feet? How many inches?
3) Measure $\frac{1}{2}$ foot of string. Cut off $\frac{1}{3}$ foot. What part of a foot is left?
4) Measure $\frac{7}{12}$ of a foot. Cut off $\frac{1}{3}$ foot. Cut off $\frac{1}{4}$ foot. What remains?
5) Measure $\frac{1}{2}$ foot. Put with it $\frac{1}{3}$ foot and $\frac{5}{12}$ foot. How many inches have you?
6) Measure $\frac{5}{6}$ yard. Put with it $\frac{1}{3}$ yard and $1\frac{1}{2}$ feet. How many yards have you?
7) Measure $\frac{5}{12}$ yard. Cut from it $\frac{1}{3}$ yard. What part of a yard is left? What number of inches?

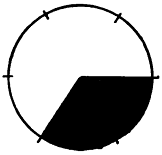
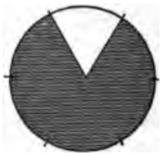
2. PICTURE WORK.

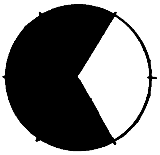
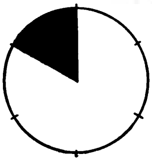
(*a*) *Read from these pictures.*

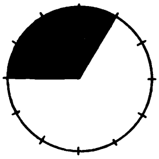
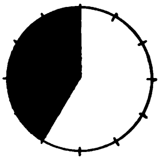
1.  +  = ?

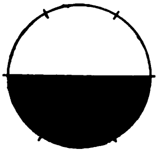
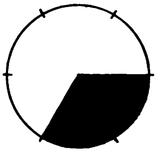
2.  +  = ?

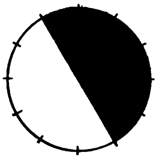
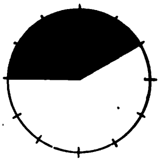
3.  +  = ?

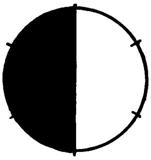
4.  +  = ?

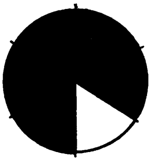
5.  +  = ?

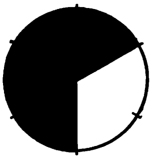
6.  +  = ?

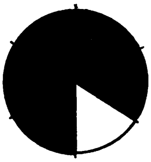
7.  +  = ?

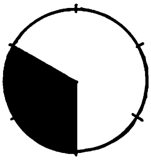
8.  +  = ?

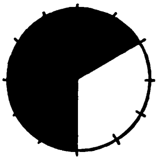
25.  $\frac{1}{?} - \frac{1}{3} = ?$

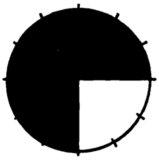
29.  $\frac{5}{?} - \frac{1}{2} = ?$

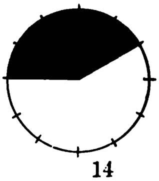
26.  $\frac{2}{?} - \frac{1}{2} = ?$

30.  $\frac{5}{?} - \frac{2}{?} = ?$

27.  $\frac{1}{?} - \frac{1}{?} = ?$

31.  $\frac{2}{?} - \frac{5}{?} = ?$

28.  $\frac{3}{?} - \frac{5}{?} = ?$

32.  $\frac{2}{?} - \frac{7}{?} = ?$

(*b*) *Draw pictures, questions and answers on blackboard.*

3. ABSTRACT DRILL.

$\frac{1}{2}+\frac{1}{3}=?$ $\frac{1}{3}-\frac{1}{12}=?$ etc.

4. PROBLEMS.

1) $2\frac{11}{12}$ bushels of potatoes were dumped on the sidewalk. Some children carried off $\frac{3}{4}$ bushel before the man returned. How many had the man remaining?
2) A grocer had 3 boxes of sugar. In one were $20\frac{1}{3}$ pounds, in another $10\frac{1}{2}$ pounds, in the third $8\frac{5}{6}$ pounds. How much sugar was there in all three boxes?
3) A lady had \$$4\frac{3}{4}$. She lost \$$1\frac{1}{2}$, and spent \$$1\frac{3}{4}$. How much had she left?
4) Mr. Jay had 2 bushels of cranberries. He gave one man $\frac{2}{3}$ bushel, another $\frac{1}{6}$ bushel, and a third $\frac{1}{2}$ bushel. What had he left?
5) Three children went berrying. One picked $\frac{5}{12}$ quart, another $\frac{1}{3}$ quart, and the third $\frac{3}{4}$ quart. How many berries did they pick together?
6) John had an hour to spend on his lessons. He studied geography $\frac{1}{3}$ hour and arithmetic $\frac{1}{4}$ hour. How much time remained for other lessons?
7) $\frac{5}{12}$ of the matches in my safe were burnt, $\frac{1}{6}$ of them had no heads. I burned last night $\frac{1}{3}$ of all that there were at first. What part of all that there were at first are the good ones remaining?
8) A man who had to travel $15\frac{5}{6}$ miles, has travelled already $8\frac{3}{4}$ miles. How many miles has he yet to go?
9) From a jug containing 4 gallons of vinegar, $\frac{1}{4}$ gallon leaked out one day, $\frac{2}{3}$ gallon the next day, $1\frac{5}{12}$ gallon the third day. How much vinegar remained in the jug?

10) A loaf of bread was cut for dinner. The family ate $\frac{2}{3}$ of a loaf, and the servants $\frac{2}{9}$. What part of a loaf was left?

11) A man had two miles to travel. He walked $\frac{3}{4}$ mile, rode in a horse-car $\frac{5}{12}$ mile, and was given a ride in a carriage for $\frac{1}{2}$ mile. How far has he yet to travel?

12) A teacher had a dozen pencils. She gave the third class $\frac{1}{3}$ dozen, the second $\frac{1}{12}$ dozen, and the first all the rest. How many pencils had the first class?

13) $\frac{1}{4}$ of the people in the car were ladies, $\frac{7}{12}$ were gentlemen, the rest were children. What part of all were children?

14) A basket half full of pears was on the steps. A boy took away so many that only $\frac{1}{6}$ basketful was left. How many did he take?

15) $\frac{5}{12}$ of the peaches on a certain tree are ripe. $\frac{1}{3}$ of all the peaches are spotted. How many more are ripe than are specked?

16) Mary had $\frac{11}{12}$ of all the examples right, and Frank had $\frac{5}{6}$ of his right. How many more had one right than the other?

17) $\frac{2}{3}$ of the pears in a basket were removed, and there were 10 left. How many were there in the basket at first?

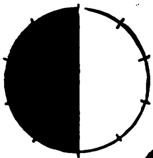
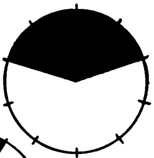
18) Three-fourths of my money is in dollar-bills, one-sixth in silver, and the rest in coppers. What part of it is in coppers?

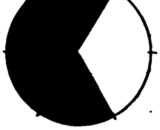
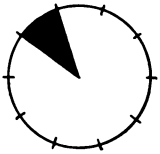
19) There was $\frac{11}{12}$ pound of sugar on the table. Two persons each used $\frac{1}{6}$ pound, and a third used $\frac{1}{12}$ pound? What part of a pound remained?

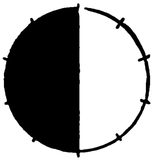
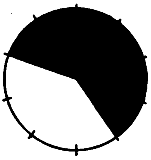
III. Halves, fifths, and tenths.

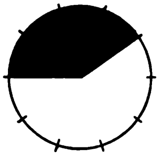
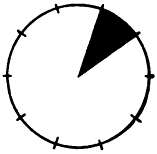
OBJECTIVE, PICTORIAL, ABSTRACT, AND PROBLEM WORK.

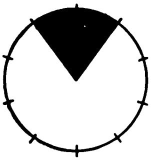
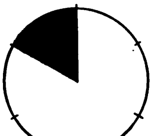
1. PICTURE WORK.

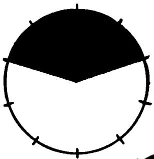
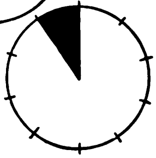
1.  +  = ?

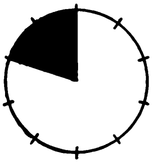
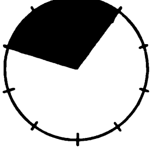
2.  +  = ?

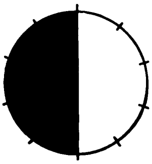
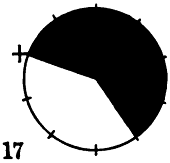
3.  +  = ?

4.  +  = ?

5.  +  = ?

6.  +  = ?

7.  +  = ?

8.  +  = ?

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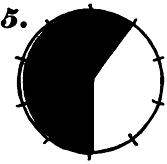
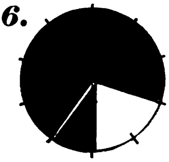


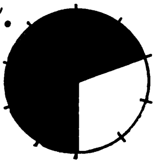
$\frac{8}{P} - \frac{1}{2} = ?$

26.



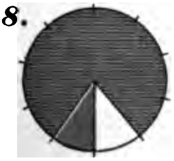
$\frac{4}{P} - \frac{1}{P} = ?$

27.



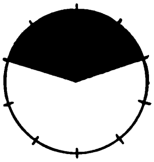
$\frac{7}{P} - \frac{1}{2} = ?$

28.



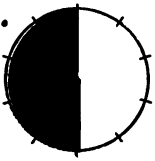
$\frac{9}{P} - \frac{1}{P} = ?$

29.



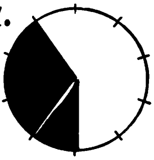
$\frac{2}{P} - \frac{1}{P} = ?$

30.



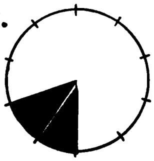
$\frac{1}{P} - \frac{1}{P} = ?$

31.



$\frac{2}{P} - \frac{3}{P} = ?$

32.



$\frac{1}{P} - \frac{1}{P} = ?$

2. Order of facts.

$\frac{1}{2} = \frac{5}{10}$
$\frac{1}{5} = \frac{2}{10}$
$\frac{2}{5} = \frac{4}{10}$
$\frac{3}{5} = \frac{6}{10}$

$\frac{4}{5} = \frac{8}{10}$
In $\frac{3}{10} = \frac{1}{5} + \frac{1}{10}$
In $\frac{7}{10} = \frac{1}{2} + \frac{1}{5}$
In $\frac{7}{10} = \frac{3}{5} + \frac{1}{10}$

In $\frac{9}{10} = \frac{1}{2} + \frac{2}{5}$
In $\frac{9}{10} = \frac{1}{5} + \frac{7}{10}$
In $\frac{9}{10} = \frac{3}{5} + \frac{3}{10}$
In $\frac{9}{10} = \frac{4}{5} + \frac{1}{10}$

$\frac{1}{2} + \frac{1}{10} =$
$\frac{1}{2} + \frac{3}{10} =$
$\frac{1}{2} + \frac{7}{10} =$
$\frac{1}{2} + \frac{9}{10} =$
$\frac{1}{5} + \frac{1}{10} =$
etc.
$\frac{2}{5} + \frac{1}{10} =$
etc.
$\frac{3}{5} + \frac{1}{10} =$
etc.

$\frac{4}{5} + \frac{1}{10} =$
etc.
$\frac{1}{2} - \frac{1}{5} =$
$\frac{1}{2} - \frac{2}{5} =$
$\frac{1}{2} - \frac{1}{10} =$
$\frac{1}{2} - \frac{3}{10} =$
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$\frac{4}{5} - \frac{3}{10} =$
$\frac{4}{5} - \frac{7}{10} =$
$\frac{3}{10} - \frac{1}{5} =$
$\frac{3}{10} - \frac{1}{10} =$
$\frac{7}{10} - \frac{1}{2} =$
$\frac{7}{10} - \frac{2}{5} =$

$\frac{7}{10} - \frac{3}{5} =$
$\frac{7}{10} - \frac{1}{10} =$
$\frac{9}{10} - \frac{1}{2} =$
$\frac{9}{10} - \frac{1}{5} =$
$\frac{9}{10} - \frac{2}{5} =$
$\frac{9}{10} - \frac{3}{5} =$
$\frac{9}{10} - \frac{4}{5} =$
$\frac{9}{10} - \frac{1}{10} =$

3. Problems.

1) I have $\frac{1}{2}$ square rod planted with nasturtiums, and $\frac{3}{5}$ square rod planted with asters. My entire garden contains 3 square rods. How much is planted with other flowers?

2) Ethel had $\$\frac{7}{10}$. She spent $\$\frac{1}{5}$ for a slate and $\$\frac{1}{2}$ for a reading-book. How much remained?

3) I have a certain sum of money; $\frac{1}{2}$ of it is in my pocket, $\frac{2}{5}$ in my desk, and the rest, 3 cents, is in my hand. How much money have I in all?

4) Mr. Howe left to his wife $\frac{3}{10}$ of his property, and to his daughters $\frac{1}{5}$ of it. The rest was for his son. What part had his son?

5) At dinner yesterday I gave my little brother $\frac{1}{2}$ an orange, and my father gave him $\frac{3}{5}$ of an orange. How much had my brother from us both?

6) Maud received at Christmas-time one bag containing $\frac{4}{5}$ pound of candy, another containing $\frac{1}{2}$ pound, and a third containing $\frac{2}{5}$ pound. How much more than a pound had she in all?

7) $\frac{2}{5}$ of the animals in a certain circus-procession were elephants, $\frac{1}{2}$ of all the animals were horses. What part of all were other animals?

8) The difference between $\frac{1}{2}$ of a certain number and $\frac{1}{5}$ of it is 6. What is the number?

9) Mr. Jones builds $\frac{3}{5}$ rod of wall of a certain kind in one day, and Mr. Jay builds $\frac{7}{10}$ rod in one day. How much do they build together in a day?

10) Three boys went fishing. One caught $\frac{1}{5}$ of the whole number of fish, another caught $\frac{3}{10}$ of all. What part did the third boy catch?

11) $\frac{2}{5}$ of the men on a certain steamer were miners, $\frac{1}{2}$ were mechanics. Of which were there more?

12) Joseph spent $\frac{3}{5}$ of his money. He gave Annie $\frac{1}{2}$ of what was left. If he had one dollar at first, how much had he remaining finally?

13) I paid $\$\frac{4}{5}$ for a hen, and $\$\frac{1}{2}$ for a chicken. What did I pay for both?

14) Miss Ames had $\$1\frac{4}{5}$. She lent $\$\frac{7}{10}$ and spent $\$\frac{1}{2}$. How much had she left?

15) John walked $\frac{1}{2}$ mile in the morning, $\frac{1}{5}$ mile in the afternoon, $\frac{3}{10}$ of a mile in the evening. What distance had he walked in all?

IV. Abstract and problem work on thirds and ninths (no objects used).

V. Abstract and problem work on halves, sevenths and fourteenths.

VI. Abstract and problem work on thirds, fifths and fifteenths.

VII. Mental drill on these questions:

$\frac{1}{2}+\frac{1}{3}+\frac{1}{5}=$
$\frac{1}{2}+\frac{1}{3}+\frac{2}{5}=$
$\frac{1}{2}+\frac{2}{3}+\frac{1}{5}=$
$\frac{1}{2}+\frac{1}{4}+\frac{1}{5}=$
$\frac{1}{2}+\frac{1}{4}+\frac{2}{5}=$

$\frac{1}{2}+\frac{1}{6}+\frac{1}{5}=$
$\frac{1}{2}+\frac{1}{6}+\frac{2}{5}=$
$\frac{1}{3}+\frac{1}{5}+\frac{1}{6}=$
$\frac{1}{3}+\frac{2}{5}+\frac{1}{6}=$
$\frac{1}{2}+\frac{1}{3}+\frac{1}{8}=$

$\frac{1}{2}+\frac{1}{3}+\frac{3}{8}=$
$\frac{1}{2}+\frac{1}{6}+\frac{1}{8}=$
$\frac{1}{2}+\frac{1}{6}+\frac{3}{8}=$
$\frac{1}{2}+\frac{1}{3}+\frac{1}{10}=$
$\frac{1}{4}+\frac{1}{6}+\frac{1}{8}=$

$\frac{1}{4}+\frac{1}{6}+\frac{3}{8}=$

$\frac{1}{2}+\frac{1}{3}+\frac{3}{10}=$

$\frac{1}{6}+\frac{1}{8}+\frac{1}{10}=$

$\frac{1}{6}+\frac{1}{8}+\frac{3}{10}=$

$\frac{1}{5}+\frac{1}{8}+\frac{1}{10}=$

$\frac{2}{5}+\frac{1}{3}+\frac{1}{10}=$

$\frac{1}{2}+\frac{1}{3}+\frac{1}{15}=$

$\frac{1}{2}+\frac{1}{3}+\frac{2}{15}=$

$\frac{1}{2}+\frac{1}{5}+\frac{1}{15}=$

$\frac{1}{2}+\frac{2}{5}+\frac{2}{15}=$

$\frac{1}{2}+\frac{2}{5}+\frac{1}{15}=$

$\frac{1}{2}+\frac{2}{5}+\frac{2}{15}=$

$\frac{1}{5}+\frac{1}{3}+\frac{3}{10}=$

Note. *Written Work.*

1) $\frac{1}{9}+\frac{2}{3}+\frac{3}{4}=?$

$\frac{4}{36}+\frac{24}{36}+\frac{27}{36}=\frac{55}{36}=1\frac{19}{36}$. *Ans.*

2) $\frac{7}{8}-(\frac{2}{5}+\frac{1}{4})=?$

$\frac{2}{5}=\frac{16}{40}$ $\qquad$ $\frac{16}{40}+\frac{10}{40}=\frac{26}{40}$

$\frac{1}{4}=\frac{10}{40}$ $\qquad$ $\frac{7}{8}=\frac{35}{40}$

$\frac{35}{40}-\frac{26}{40}=\frac{9}{40}$. *Ans.*

Many examples no more difficult than the above should be worked, the denominator being determined at sight, and the children being allowed to use no more figures than are used in the work shown here. If this work is done thoroughly, there seems to be no need of teaching a written process of reducing to least common denominator by factoring, etc., especially as working with large denominators is not practical.

* * *

MULTIPLICATION.

Order of Work.

I. A fraction or a mixed number multiplied by a whole number; $\frac{1}{5}\times 5$ ($\frac{1}{2}$ taken 5 times), $2\frac{4}{5}\times 2$.

II. A whole number, a fraction, or a mixed number multiplied by a fraction (or a mixed number); $5\times\frac{1}{2}$ ($\frac{1}{2}$ of 5), $\frac{1}{4}\times\frac{1}{2}$, $2\frac{1}{2}\times\frac{1}{3}$, $3\frac{1}{3}\times 2\frac{1}{2}$.

I. First Case.

1. OBJECTIVE WORK.

(*a*) *Disks.*

Show $\frac{1}{2}$. Show another half, another, another, another. How many halves have you? Put them together to form whole disks. How many have you? Tell about 5 halves. Tell about $\frac{1}{2}$ taken 5 times. Tell about $\frac{1}{2}$ taken 7 times; 9 times.

Show $\frac{2}{3}$. Show another $\frac{2}{3}$. Tell about $\frac{2}{3}$ taken twice.

Show $\frac{2}{3}$. Show three more $\frac{2}{3}$. What have you now? What is $\frac{2}{3}$ taken 4 times?

Etc.

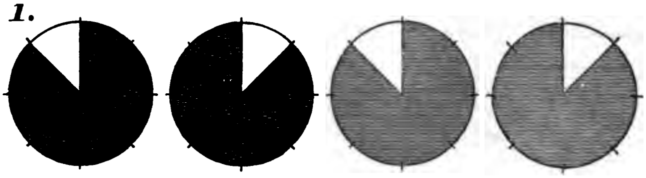
(*b*) *Denominate numbers.*

1) Measure $\frac{1}{2}$ foot of string. Put with it the same length measured four times more. How many feet have you now?
2) Take $\frac{3}{4}$ gallon of water. Put with it another $\frac{3}{4}$ gallon. How many gallons? How many quarts?
3) Measure $\frac{5}{6}$ quart of water three times. How many quarts have you?
4) Show five $\frac{3}{8}$ quart of water. How many quarts?
5) Show three $\frac{3}{4}$ pint of water. How many quarts?
6) Show four $\frac{2}{3}$ quart of corn. How many quarts?
7) Show five $\frac{2}{3}$ foot of string. How many feet? How many yards? How many inches?
8) Show four $\frac{2}{5}$ bushel. How many bushels? How many pecks?

2. PICTURE WORK.

(*a*) *Read:*

1.



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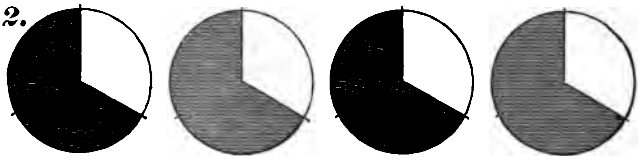

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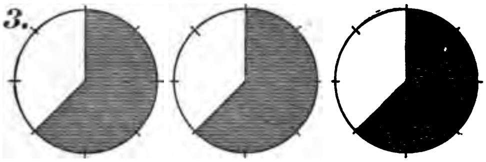

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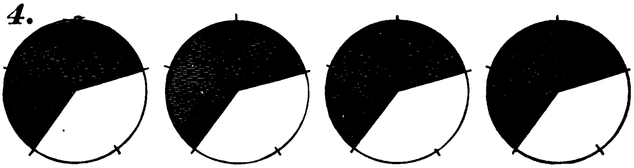

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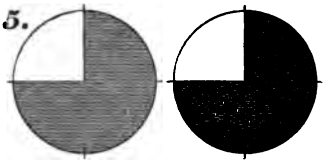

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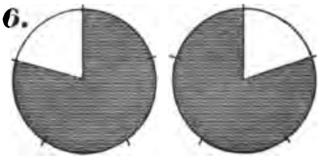

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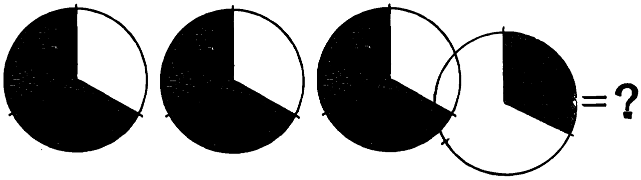

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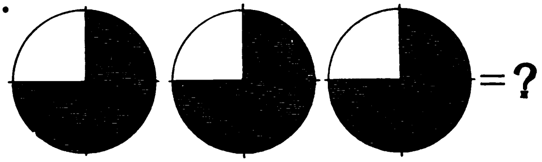

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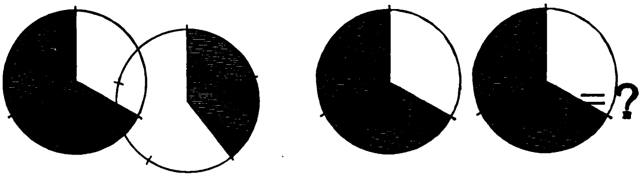

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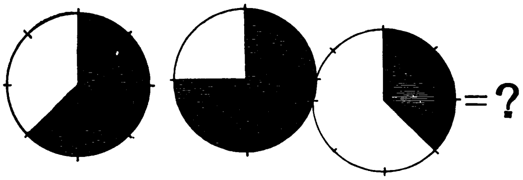

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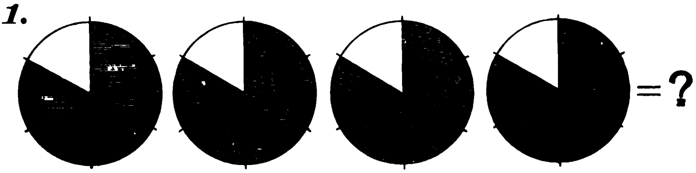

(*b*) *Draw pictures to represent these facts:*

$\frac{2}{3} \times 2 = (\frac{2}{3}$ taken twice $=)$
$\frac{5}{6} \times 2 = (\frac{5}{6}$ taken twice $=)$
$\frac{3}{4} \times 3 = (\frac{3}{4}$ taken three times $=)$
$\frac{1}{3} \times 4 = (\frac{1}{3}$ taken four times $=)$
$\frac{3}{4} \times 2 = (\frac{3}{4}$ taken twice)
Etc.

3. ABSTRACT WORK. MENTAL DRILL.

$\frac{3}{4} \times 2 = ?$
$\frac{5}{6} \times 2 = ?$
$\frac{3}{4} \times 3 = ?$
$\frac{2}{3} \times 2 = ?$
$\frac{3}{4} \times 4 = ?$
$\frac{5}{6} \times 3 = ?$
$\frac{2}{3} \times 3 = ?$
$\frac{1}{3} \times 4 = ?$
$\frac{2}{3} \times 4 = ?$
$\frac{1}{4} \times 6 = ?$
$\frac{2}{5} \times 3 = ?$

$\frac{1}{3} \times 8 = ?$
$\frac{1}{4} \times 10 =$
$\frac{2}{3} \times 5 =$
$\frac{5}{6} \times 4 =$
$\frac{1}{3} \times 8 =$
$\frac{2}{5} \times 7 =$
$\frac{3}{5} \times 2 =$
$\frac{3}{8} \times 4 =$
$\frac{3}{5} \times 3 =$
$\frac{4}{5} \times 3 =$
$\frac{1}{2} \times 5 =$

$\frac{4}{5} \times 4 =$
$\frac{5}{8} \times 2 =$
$\frac{5}{8} \times 4 =$
$\frac{1}{2} \times 7 =$
$\frac{4}{9} \times 3 =$
$\frac{3}{4} \times 5 =$
$\frac{5}{9} \times 3 =$
$\frac{7}{8} \times 2 =$
$\frac{4}{9} \times 5 =$
$\frac{7}{8} \times 3 =$
Etc.

$1\frac{1}{2} \times 2 =$
$2\frac{1}{3} \times 3 =$
$2\frac{3}{4} \times 2 =$
$2\frac{1}{2} \times 2 =$
$1\frac{1}{2} \times 5 =$
$2\frac{2}{3} \times 2 =$
$1\frac{3}{4} \times 3 =$
$2\frac{3}{4} \times 3 =$
$2\frac{1}{3} \times 4 =$
$3\frac{1}{2} \times 2 =$
$2\frac{2}{3} \times 3 =$
$1\frac{1}{2} \times 3 =$
$2\frac{1}{2} \times 3 =$
$1\frac{3}{4} \times 2 =$

$1\frac{3}{4} \times 4 =$
$1\frac{1}{5} \times 2 =$
$1\frac{3}{8} \times 2 =$
$2\frac{1}{4} \times 2 =$
$1\frac{1}{4} \times 3 =$
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$1\frac{1}{5} \times 3 =$
$1\frac{5}{8} \times 2 =$
$2\frac{3}{8} \times 2 =$
$1\frac{5}{6} \times 2 =$
$2\frac{1}{8} \times 2 =$
$1\frac{1}{5} \times 3 =$
$1\frac{5}{6} \times 4 =$
$4\frac{1}{2} \times 2 =$

$3\frac{1}{3} \times 2 =$
$2\frac{5}{6} \times 2 =$
$1\frac{1}{2} \times 8 =$
$2\frac{1}{5} \times 2 =$
$2\frac{1}{6} \times 2 =$
$4\frac{1}{3} \times 2 =$
$3\frac{1}{6} \times 2 =$
$3\frac{1}{4} \times 2 =$
$5\frac{1}{3} \times 2 =$
$1\frac{7}{8} \times 2 =$
$2\frac{5}{8} \times 2 =$
$3\frac{1}{3} \times 4 =$
$1\frac{4}{5} \times 2 =$
Etc.

4. **Problems.**

1) Four men bought a barn together, each man paying $\frac{3}{8}$ of a thousand dollars. What was the cost of the barn?
2) How much less than 2 pounds of candy had five boys, each of whom had bought $\frac{1}{3}$ pound?
3) What is the cost of 4 cords of wood at \$$5\frac{3}{4}$ per cord, and 3 tons of coal at \$$6\frac{1}{2}$ per ton?
4) Max has \$$\frac{2}{5}$, and James has five times as much money as Max. How much has James?
5) On the table are six tumblers each containing $\frac{3}{4}$ pint of jelly. How many quarts of jelly on the table?
6) Mrs. Thomas had 6 pounds of candy. She gave $\frac{5}{8}$ pound to each of her four children. How much remained?
7) A man gave $\frac{8}{9}$ of his property to his sons. He wished two each to have $\frac{1}{3}$ of the property, and the third to have the remainder. What part of the entire property had the third son?
8) 3 pounds of rice are sold for 18c. What would be the value of $2\frac{5}{6}$ pounds?
9) I walked $2\frac{3}{4}$ miles daily for a week. How many miles did I walk in the week?
10) Six men are to live in a lighthouse for a week. Each consumes $\frac{3}{4}$ pound of meat daily. How much meat will they need to maintain them?
11) A coal-dealer sold $5\frac{4}{5}$ tons of coal to each of four families. How many tons did he sell?
12) A boy picked up $\frac{5}{6}$ bushel of apples under each of 5 trees. How many less than 10 bushels did he gather?
13) Mrs. Berry paid \$$5\frac{3}{4}$ for a bonnet every year from 1885 to 1888 (inclusive). How much did her bonnets cost?

14) Mr. Peck took his three girls and four boys to Boston. To each girl he gave $\$\frac{1}{4}$, and to each boy $\$\frac{3}{10}$. How much did the children have to spend?

15) From a bin of 20 bushels a man fed an animal $\frac{5}{6}$ peck of corn daily for 12 days. How much corn was there left in the bin?

16) A lady bought sugar at the rate of $8\frac{3}{4}$ cents per pound. What would be the value of 5 pounds?

17) $3\frac{2}{3}$ rods of fence are needed for each side of a square garden. How many rods of fence are needed to surround it entirely?

18) Herbert spent $\frac{2}{5}$ of a dollar every day for 6 days, and then had 40 cents remaining. How much had he at first?

19) A picnic-party numbered 16. Each ate $\frac{3}{8}$ pound of candy. How much had they all?

20) Amos Payne owns 4 lots of land, each of which contains $4\frac{2}{3}$ acres. How much land does he own?

21) John sawed wood for $5\frac{1}{2}$ days at the rate of $\$1\frac{1}{8}$ per day. How much did he earn?

22) I bought $2\frac{2}{3}$ dozen note-books at $\$1\frac{1}{4}$ per dozen. What did all cost?

23) John and Arthur were 11 miles apart. John walked $\frac{3}{5}$ mile an hour for two hours, and Arthur $1\frac{1}{3}$ mile an hour for three hours. How far apart were they then?

24) A family used $4\frac{5}{8}$ pounds of meat every week for a month. How much meat had they in the month?

25) A school-girl paid $\$4\frac{3}{4}$ board per week for 3 weeks. What did the three weeks' board cost her?

II. Second Case.

1. OBJECTIVE WORK.

(a) *Disks.*

Show two. Cut each into thirds. How many thirds? Take $\frac{1}{3}$ of all the thirds that you have. What part of a disk have you? What is $\frac{1}{3}$ of 2?

Show 2 disks. Cut each into halves. How many halves? Take $\frac{3}{4}$ of all the halves. What have you? What is $\frac{3}{4}$ of 2?

Show 4 disks. Cut each into thirds. Take $\frac{2}{3}$ of all the thirds. What have you? What is $\frac{2}{3}$ of 4?

Show $\frac{2}{3}$. Take $\frac{1}{2}$ of it. What part of the whole disk have you? What is $\frac{2}{3}$ of $\frac{1}{2}$?

Take $\frac{2}{3}$. Show $\frac{1}{4}$ of it. Show $\frac{3}{4}$ of $\frac{2}{3}$. What have you? What is $\frac{3}{4}$ of $\frac{2}{3}$?

Show $\frac{5}{6}$. Show it as twelfths. How many twelfths? Take $\frac{1}{2}$ of all the twelfths. What is $\frac{1}{2}$ of $\frac{10}{12}$? What is $\frac{1}{2}$ of $\frac{5}{6}$?

Etc.

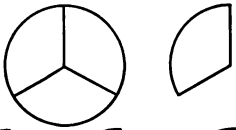
(*b*) *Denominate numbers.*

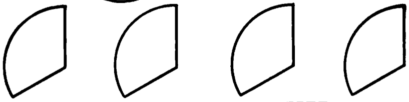
1) Show $\frac{2}{3}$ of 4 feet of string. How many feet? How many inches?
2) Measure $\frac{3}{4}$ of $1\frac{1}{2}$ yards. How many yards? How many feet?
3) Measure 2 pecks of corn. Take $\frac{3}{4}$ of it. How many pecks? How many quarts?
4) Measure $2\frac{1}{2}$ quarts of water. Take $\frac{1}{2}$ of it. How many quarts? How many pints?
5) Measure 1 rod. Show $\frac{1}{2}$ of it. How many yards? How many feet? What is $\frac{1}{2}$ of $5\frac{1}{2}$ yards? $\frac{1}{2}$ of $16\frac{1}{2}$ feet?
6) Weigh 2 pounds of corn. Take $\frac{3}{4}$ of it (as nearly as possible). Weigh. How many pounds? What is $\frac{3}{4}$ of 2?
7) Show $2\frac{3}{4}$ square feet. Measure off $\frac{1}{2}$ of it. How many square feet? What is $\frac{1}{2}$ of $2\frac{3}{4}$?

2. PICTURE WORK.

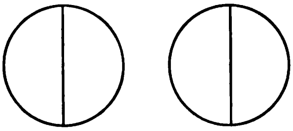
(*a*) *Read:*

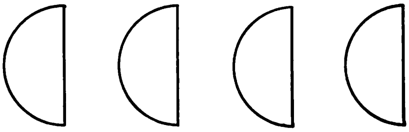
1.

$\frac{3}{4}$ of  = ?

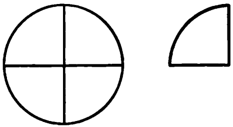
$\frac{3}{4}$ of  = ?

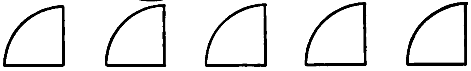
2.

$\frac{3}{4}$ of  = ?

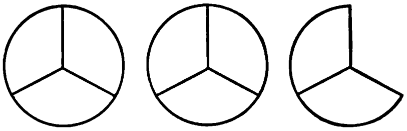
$\frac{3}{4}$ of  = ?

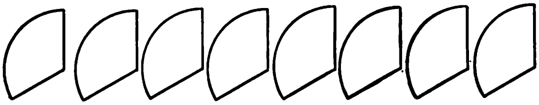
3.

$\frac{3}{5}$ of  = ?

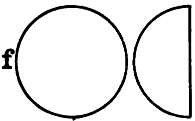
$\frac{3}{5}$ of  = ?

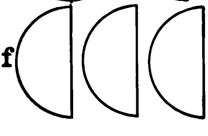
4.

$\frac{1}{4}$ of  = ?

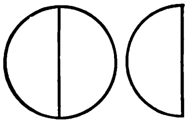
$\frac{1}{4}$ of  = ?

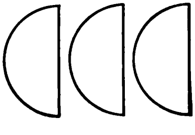
5.

$\frac{2}{3}$ of  = ?

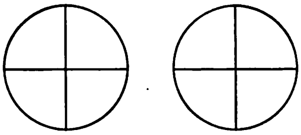
$\frac{2}{3}$ of  = ?

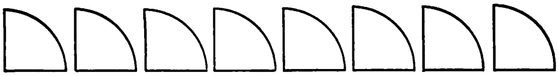
6.

$\frac{1}{3}$ of  = ?

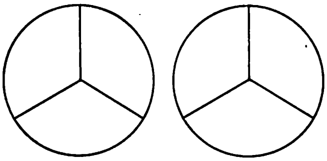
$\frac{1}{3}$ of  = ?

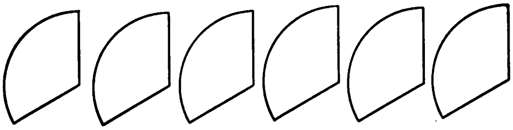
7\.

$\frac{3}{8}$ of  = ?

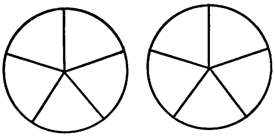
$\frac{3}{8}$ of  = ?

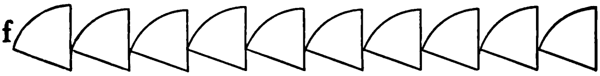
8\.

$\frac{2}{3}$ of  = ?

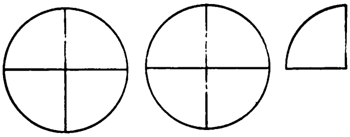
$\frac{2}{3}$ of  = ?

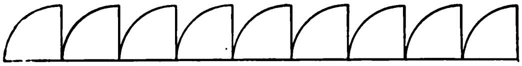
9\.

$\frac{1}{5}$ of  = ?

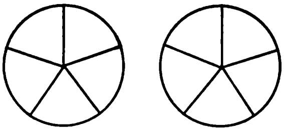
$\frac{1}{5}$ of  = ?

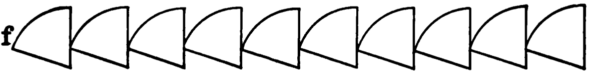
10\.

$\frac{1}{3}$ of  = ?

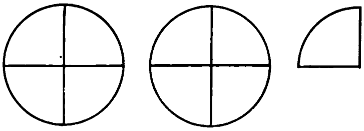
$\frac{1}{3}$ of  = ?

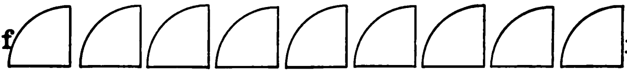
11.

$\frac{2}{5}$ of  = ?

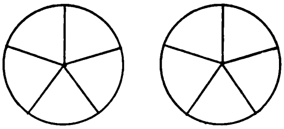
$\frac{2}{5}$ of  = ?

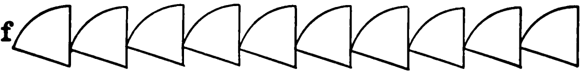
12.

$\frac{2}{3}$ of  = ?

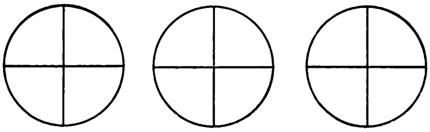
$\frac{2}{3}$ of  = ?

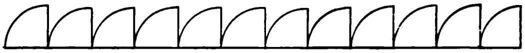
13.

$\frac{3}{5}$ of  = ?

$\frac{3}{5}$ of  = ?

14.

$\frac{1}{4}$ of  = ?

$\frac{1}{4}$ of  = ?

(*b*) *Draw pictures to represent:*

$\frac{3}{4}$ of $3 =$
$\frac{2}{3}$ of $2 =$
$\frac{4}{5}$ of $2 =$
$\frac{5}{6}$ of $1\frac{1}{2} =$

$\frac{3}{4}$ of $2\frac{1}{2} =$
$\frac{3}{4}$ of $2\frac{1}{3} =$
$\frac{3}{4}$ of $\frac{1}{2} =$
$\frac{2}{3}$ of $\frac{1}{2} =$

$\frac{1}{3}$ of $\frac{1}{4} =$
$\frac{2}{5}$ of $\frac{1}{2} =$
$\frac{2}{3}$ of $\frac{1}{4} =$
Etc.

3. Abstract work. Mental drill.

$\frac{2}{3}$ of $4 =$
$\frac{2}{3}$ of $1\frac{1}{2} =$
$\frac{1}{4}$ of $1\frac{1}{2} =$
$\frac{3}{4}$ of $2 =$
$\frac{1}{2}$ of $3\frac{1}{2} =$
$\frac{2}{3}$ of $4\frac{1}{2} =$
$\frac{1}{4}$ of $2\frac{2}{3} =$
$\frac{1}{4}$ of $3 =$
$\frac{2}{5}$ of $2 =$
$\frac{3}{4}$ of $2 =$
$\frac{3}{4}$ of $1\frac{1}{3} =$
$\frac{2}{5}$ of $2\frac{1}{2} =$

$\frac{1}{2}$ of $1\frac{1}{3} =$
$\frac{1}{2}$ of $1\frac{1}{5} =$
$\frac{1}{3}$ of $2 =$
$\frac{1}{3}$ of $2\frac{1}{4} =$
$\frac{2}{3}$ of $1\frac{1}{2} =$
$\frac{2}{3}$ of $2\frac{1}{4} =$
$\frac{1}{4}$ of $2 =$
$\frac{1}{4}$ of $1\frac{1}{3} =$
$\frac{2}{5}$ of $1\frac{1}{4} =$
$\frac{5}{8}$ of $1\frac{1}{2} =$
$\frac{1}{3}$ of $1\frac{1}{2} =$
$\frac{3}{5}$ of $2 =$

$\frac{3}{4}$ of $2\frac{2}{3} =$
$\frac{4}{5}$ of $2 =$
$\frac{2}{3}$ of $2 =$
$\frac{3}{5}$ of $2\frac{1}{2} =$
$\frac{3}{4}$ of $3 =$
$\frac{1}{6}$ of $2\frac{2}{5} =$
$\frac{4}{5}$ of $2\frac{1}{2} =$
$\frac{5}{8}$ of $2 =$
$\frac{5}{6}$ of $2\frac{2}{5} =$
$\frac{2}{5}$ of $3 =$
Etc.

$\frac{1}{2}$ of $\frac{1}{3} =$
$\frac{1}{2}$ of $\frac{3}{4} =$
$\frac{1}{2}$ of $\frac{1}{6} =$
$\frac{1}{3}$ of $\frac{1}{3} =$
$\frac{2}{3}$ of $\frac{1}{2} =$
$\frac{3}{4}$ of $\frac{1}{2} =$
$\frac{3}{4}$ of $\frac{2}{3} =$
$\frac{2}{5}$ of $\frac{1}{2} =$
$\frac{3}{5}$ of $\frac{1}{2} =$
$\frac{1}{6}$ of $\frac{1}{2} =$
$\frac{5}{6}$ of $\frac{3}{4} =$

$\frac{1}{2}$ of $\frac{1}{4} =$
$\frac{1}{2}$ of $\frac{1}{5} =$
$\frac{1}{2}$ of $\frac{5}{6} =$
$\frac{2}{3}$ of $\frac{2}{3} =$
$\frac{2}{3}$ of $\frac{1}{4} =$
$\frac{1}{4}$ of $\frac{1}{3} =$
$\frac{3}{4}$ of $\frac{1}{3} =$
$\frac{4}{5}$ of $\frac{1}{2} =$
$\frac{5}{6}$ of $\frac{2}{3} =$
$\frac{1}{3}$ of $\frac{1}{4} =$
$\frac{1}{2}$ of $\frac{4}{5} =$
Etc.

$\frac{1}{2}$ of $\frac{3}{4} =$
$\frac{1}{2}$ of $\frac{3}{5} =$
$\frac{1}{3}$ of $\frac{1}{2} =$
$\frac{1}{3}$ of $\frac{1}{4} =$
$\frac{1}{4}$ of $\frac{1}{2} =$
$\frac{1}{4}$ of $\frac{2}{3} =$
$\frac{1}{5}$ of $\frac{1}{2} =$
$\frac{5}{6}$ of $\frac{1}{2} =$
$\frac{2}{3}$ of $\frac{1}{3} =$
$\frac{3}{4}$ of $\frac{3}{4} =$
$\frac{1}{4}$ of $\frac{3}{5} =$

4. Problems.

1) At \$$\frac{2}{3}$ per piece, what must I pay for $\frac{3}{4}$ of a piece of ribbon?

2) If I divide $\$\frac{3}{5}$ among 9 boys, how much will each have?

3) Three-eighths of a box of colored crayon were divided evenly among six teachers. What part of the boxful had each?

4) I distributed $\frac{3}{5}$ pound of nuts evenly among 6 boys. What part of a pound had each boy?

5) Three-fourths of a quart of chestnuts were divided among 12 boys. What part of a quart had each?

6) A man owned $\frac{5}{8}$ of a ship, but sold $\frac{2}{3}$ of his share. What part of the ship did he still own?

7) Mr. Jenks sold at one time $\frac{2}{5}$ of his land, and at another time $\frac{1}{3}$ of the remainder. How much of his land has he sold?

8) Five-sixths of the enrolled scholars are at school. One-half of all that are in school are studying a history lesson. What part of all the enrolled scholars are studying the history lesson?

9) A man who owned $\frac{5}{8}$ of a mill, sold $\frac{1}{2}$ of his share for $100. At this rate what was the value of the whole mill?

10) If one dollar will buy $\frac{1}{3}$ yard of velvet, how much will $\$\frac{3}{4}$ buy?

11) The maid put $\frac{3}{4}$ pound of butter on the table. One-half of it was eaten. What part of a pound was left?

12) One-half of all John's money is in his pocket. If he lose $\frac{3}{4}$ of what is in his pocket, what part of all his money will he have lost?

13) Harry had $\frac{2}{3}$ quart of peanuts. He gave away $\frac{3}{4}$ of what he had. What part of a quart had he left?

14) Four-fifths of the guests at a hotel were Americans. One-half of the Americans were from New England. What part of all the guests were from New England?

15) $4\frac{1}{3}$ pounds of beef were cooked for dinner. One-

third of it was eaten. How many pounds remained?

16) Mr. Boyne bought $7\frac{3}{5}$ pounds of soap for a half of a dollar. How much soap could be bought with a quarter of a dollar?

17) Five tons of coal cost \$$18\frac{1}{2}$. What is the cost of one ton?

18) The town of A is half-way between the town of B and C, which places are $8\frac{2}{3}$ miles apart. How far is it from A to B?

19) What will be the cost of $\frac{3}{4}$ yard of velvet at \$$2\frac{2}{5}$ per yard?

20) If a square foot of land is worth $12\frac{1}{2}$ cents, what is the value of $\frac{3}{5}$ of a square foot?

21) When a dozen tennis-balls cost \$$4\frac{1}{3}$, what will be the cost of $\frac{2}{3}$ dozen?

22) A boy who had \$$3\frac{3}{4}$ spent $\frac{3}{5}$ of it. How much money had he left?

23) A book which cost \$$3\frac{3}{4}$ was sold at a gain of half the cost. For what did it sell?

24) The cook made $4\frac{1}{2}$ pounds of butter into 18 pats. What part of a pound was there in each pat?

25) Martha had \$$1\frac{1}{5}$. Having given her brother one-half of all she had, what sum had she left?

26) In a pail were $7\frac{3}{5}$ pounds of sugar. Two-thirds of it having been used for preserving, how much was left?

Note. Children will have noticed probably in the oral work that numerators are multiplied for the numerator of the result, and denominators for the denominator of the result. If not, they may be led now to notice it. They may be led also to observe the necessity of changing mixed numbers to improper fractions before multiplying. It is not wise to give examples involving the use of large denominators.

DIVISION.

ORDER OF WORK.

I. **Divisor smaller than dividend;** $2 \div \frac{3}{4} = ?$ **(how many** $\frac{3}{4}$ **in** 2**?),** $\frac{3}{4} \div \frac{1}{2}$, $4 \div 2\frac{1}{2}$, $3\frac{1}{2} \div 2$, $3\frac{1}{2} \div 1\frac{1}{2}$, **etc.**

II. **Divisor larger than dividend;** $\frac{3}{4} \div 2 = ?$ **(**$\frac{3}{4}$ **is what part of** 2**?),** $\frac{1}{2} + \frac{3}{4}$, $2 \div 3\frac{1}{2}$, **etc.**

I. First Case.

1. OBJECTIVE WORK.

(a) *Disks.*

Show two disks. Cut into fourths.

Show three-fourths. Can you find another three-fourths? How many three-fourths have you? Show the piece that is left. Place it upon one of the three-fourths pieces. What part of three-fourths is it? In two how many three-fourths?

Cut three disks into as many two-thirds as you can find. What part of two-thirds is the piece left over? How many two-thirds in three?

Show one-half of a disk. Cut the other half into fourths. Show three-fourths of a disk. How many halves in three-fourths? (What part of the half-disk is the piece left over?) $\frac{3}{4} \div \frac{1}{2} = ?$

Cut a disk into thirds. Cut one of the thirds into two equal parts. Show five-sixths. Show one-third. Another third. What part of one-third is the piece remaining? $\frac{5}{6} \div \frac{1}{3} = ?$

Show four disks. Cut all into halves. Show $2\frac{1}{2}$. How many halves left (after taking out $2\frac{1}{2}$ from 4)? $2\frac{1}{2}$ is how many halves? $1\frac{1}{2}$ is how many halves? $\frac{3}{2}$ is what part of $\frac{5}{2}$? $4 \div 2\frac{1}{2} = ?$

(*b*) *Denominate numbers.*

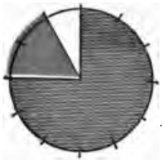
1) Measure two quarts of corn. Take out $\frac{3}{4}$ of a quart as many times as you can. What part of three-fourths of a quart is the quantity remaining? How many three-fourths in two? $2 \div \frac{3}{4} = ?$
2) Weigh $3\frac{1}{2}$ pounds of corn. From that quantity weigh out $1\frac{1}{2}$ pounds as many times as you can. What is the weight of the quantity remaining? What part of $1\frac{1}{2}$ pounds is $\frac{1}{2}$ pound? $3\frac{1}{2} \div 1\frac{1}{2} = ?$
3) Measure $2\frac{3}{4}$ yards of tape. Cut off $\frac{5}{8}$ yard as many times as possible. What is left? What part of $\frac{5}{8}$ yard is the piece left over? How many $\frac{5}{8}$ in $2\frac{3}{4}$? $2\frac{3}{4} \div \frac{5}{8} = ?$
4) Measure $1\frac{3}{5}$ feet. Take from this $\frac{1}{2}$ foot as many times as possible. What part of $\frac{1}{2}$ foot is the part left? $1\frac{3}{5} \div \frac{1}{2} = ?$
5) Measure one rod. How many yards? Take away from it two yards as many times as you can. What part of 2 yards is the part left? $5\frac{1}{2} \div 2 = ?$
6) Measure one rod. Take away from it $2\frac{1}{2}$ feet as many times as possible. What part of $2\frac{1}{2}$ feet is the part left? $16\frac{1}{2} \div 2\frac{1}{2} = ?$
7) Show $\frac{5}{6}$ foot of string. Cut off from it $\frac{1}{3}$ foot as many times as you can. Compare the length of the piece left with a one-third-foot-piece. $\frac{5}{6} \div \frac{1}{3} = ?$
8) Measure three quarts of corn. Take out $\frac{3}{4}$ quart as many times as you can. $3 \div \frac{3}{4} = ?$

Etc.

2 PICTURE WORK.

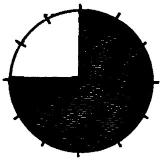
(*a*) ***Read:***

1.



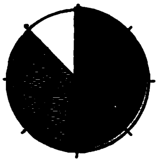
$\frac{11}{12} \div \frac{3}{4} = ?$

5.



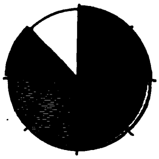
$\frac{3}{4} \div \frac{2}{3} = ?$

2.



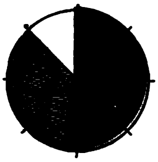
$\frac{7}{8} \div \frac{1}{2} = ?$

6.



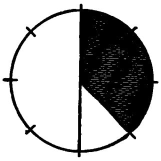
$\frac{7}{8} \div \frac{1}{4} = ?$

3.



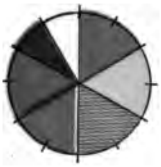
$\frac{3}{4} \div \frac{3}{8} = ?$

7.



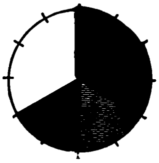
$\frac{1}{2} \div \frac{3}{8} = ?$

4.



$\frac{11}{12} \div \frac{1}{6} = ?$

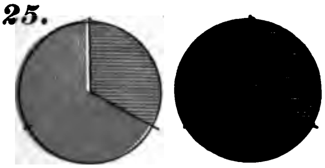
8.



$\frac{2}{3} \div \frac{1}{6} = ?$

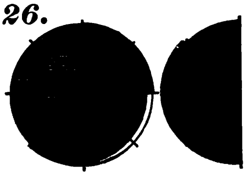
$2 \div \frac{2}{?} = ?$

25.



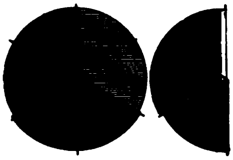
$1\frac{1}{2} \div \frac{3}{?} = ?$

26.



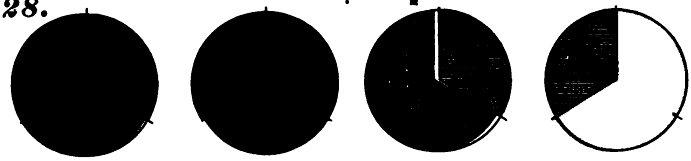
$1\frac{1}{2} \div \frac{1}{?} = ?$

27.



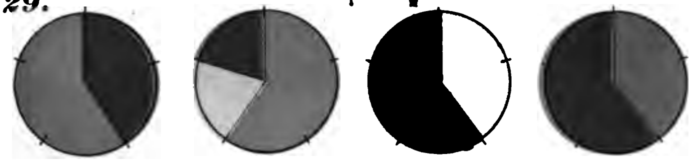
$4 \div \frac{2}{?} = ?$

28.

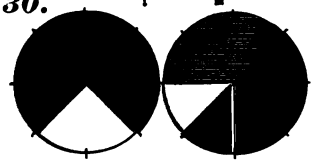


$4 \div \frac{3}{?} = ?$

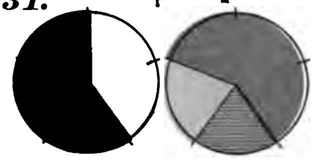
29.



30. $2 \div \frac{3}{?} = ?$

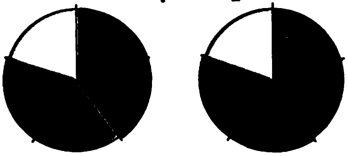


31. $2 \div \frac{3}{?} = ?$



$2 \div \frac{2}{?} = ?$

32.



(*b*) *Illustrate:*

$3 \div \frac{3}{4} =$
$4 \div \frac{2}{3} =$
$2 \div \frac{2}{5} =$
$\frac{7}{8} \div \frac{1}{2} =$
$\frac{2}{3} \div \frac{1}{4} =$

$\frac{5}{6} \div \frac{2}{8} =$
$2\frac{1}{2} \div 2 -$
$4 \div 1\frac{1}{4} =$
$3\frac{1}{4} \div 2\frac{1}{2} =$
Etc.

3. **Abstract work. Mental drill.**

$2 \div \frac{3}{4} =$
$3 \div \frac{3}{5} =$
$3 \div \frac{5}{6} =$
$4 \div \frac{3}{4} =$
$4 \div \frac{2}{3} =$
$5 \div \frac{3}{8} =$
$4 \div \frac{3}{5} =$

$4 \div \frac{2}{5} =$
$3 \div \frac{2}{3} =$
$4 \div \frac{4}{5} =$
$2 \div \frac{3}{5} =$
$3 \div \frac{4}{5} =$
$5 \div \frac{2}{3} =$
$3 \div \frac{5}{8} =$

$2 \div \frac{2}{3} =$
$3 \div \frac{3}{4} =$
$2 \div \frac{5}{6} =$
$3 \div \frac{2}{5} =$
$2 \div \frac{3}{8} =$
$2 \div \frac{4}{5} =$
$2 \div \frac{5}{8} =$

$\frac{1}{2} \div \frac{2}{5} =$
$\frac{11}{12} \div \frac{1}{6} =$
$\frac{4}{5} \div \frac{3}{10} =$
$\frac{7}{8} \div \frac{3}{4} =$
$\frac{3}{4} \div \frac{1}{3} =$
$\frac{2}{3} \div \frac{1}{4} =$
$\frac{5}{6} \div \frac{1}{2} =$
$\frac{3}{8} \div \frac{1}{4} =$
$\frac{2}{3} \div \frac{1}{2} =$
$\frac{7}{9} \div \frac{1}{3} =$

$\frac{3}{8} \div \frac{1}{4} =$
$\frac{9}{10} \div \frac{2}{5} =$
$\frac{3}{4} \div \frac{5}{8} =$
$\frac{7}{8} \div \frac{1}{4} =$
$\frac{3}{4} \div \frac{2}{3} =$
$\frac{5}{8} \div \frac{1}{2} =$
$\frac{5}{6} \div \frac{3}{4} =$
$\frac{2}{3} \div \frac{1}{6} =$
$\frac{5}{6} \div \frac{1}{4} =$
$\frac{2}{3} \div \frac{2}{9} =$

$\frac{3}{4} \div \frac{3}{8} =$
$\frac{11}{12} \div \frac{3}{4} =$
$\frac{3}{4} \div \frac{3}{8} =$
$\frac{7}{8} \div \frac{1}{2} =$
$\frac{3}{4} \div \frac{1}{6} =$
$\frac{5}{8} \div \frac{1}{4} =$
$\frac{2}{3} \div \frac{1}{4} =$
$\frac{4}{5} \div \frac{1}{2} =$
$\frac{3}{5} \div \frac{1}{3} =$
$\frac{4}{5} \div \frac{1}{3} =$

$3 \div 1\frac{1}{2} =$
$4\frac{1}{2} \div 2 =$
$1\frac{1}{2} \div 1\frac{1}{4} =$
$3\frac{1}{2} \div 2 =$
$2\frac{3}{4} \div 1\frac{1}{2} =$
$3\frac{1}{4} \div 2\frac{1}{2} =$
$4 \div 1\frac{1}{4} =$
$2\frac{2}{3} \div 1\frac{1}{2} =$

$3\frac{2}{3} \div 1\frac{1}{2} =$
$3 \div 1\frac{1}{3} =$
$3 \div 1\frac{2}{3} =$
$4\frac{1}{2} \div 2\frac{1}{2} =$
$2\frac{1}{3} \div 1\frac{2}{3} =$
$5 \div 2\frac{1}{2} =$
$4\frac{1}{3} \div 2 =$

$2\frac{2}{5} \div 1\frac{1}{2} =$
$3\frac{1}{2} \div 1\frac{1}{4} =$
$2\frac{1}{2} \div 2 =$
$3\frac{1}{2} \div 1\frac{3}{4} =$
$3\frac{1}{2} \div 2\frac{1}{4} =$
$3 \div 2\frac{1}{3} =$
$1\frac{3}{4} \div 1\frac{1}{3} =$

PROBLEMS.

1) From a box containing $\frac{1}{2}$ pound of candy, small boxes each containing $\frac{1}{5}$ pound are to be filled. How many boxes can be filled, and what will be left over?
2) Miss Howe had $\$\frac{3}{4}$ with which to buy cloth at $\$\frac{3}{8}$ per yard. How many yards could she buy?
3) A mother gave to each of her children $\frac{2}{9}$ of a yard of ribbon from a piece $1\frac{1}{3}$ yard long. There was none left. How many children had she?
4) I had $\frac{2}{3}$ bushel of walnuts. I put them into bags each of which held $\frac{1}{4}$ bushel. How many bags did I fill, and what part of a bagful remained?
5) Mrs. Fox wished to buy some lace that cost $\$\frac{1}{2}$ per yard. She had $\$\frac{3}{5}$. How much lace could she buy?
6) Mary had $\frac{3}{4}$ gallon of vinegar to pour into a jug that held exactly $\frac{2}{3}$ gallon. What part of the jugful had she left over?
7) How many $1\frac{1}{2}$ pint bottles can be filled from a cask of wine containing 2 gallons, 1 quart, 1 pint?
8) At $\$\frac{3}{8}$ per yard, how many yards of cloth can be bought with $12?
9) If it takes $\frac{2}{3}$ of a yard of cloth for one vest, how many vests can be made from 6 yards?
10) How many bushels of wheat at $\$2\frac{1}{3}$ per bushel can be bought with $7?
11) If wool costs $\$1\frac{3}{4}$ per pound, how many pounds can be bought with $7?
12) At $\$\frac{2}{5}$ apiece how many young rabbits can I buy with $4?
13) How many yards of silk at $\$\frac{3}{4}$ per yard can be bought with $9?
14) How many times can a pitcher which holds $1\frac{1}{2}$ quarts be filled from a pail containing $4\frac{1}{2}$ quarts?

15) A coal-bin containing $3\frac{1}{3}$ tons was filled by loads of $\frac{5}{6}$ ton each. How many loads were required?

16) Mrs. Smith divided $\$16\frac{3}{4}$ among some poor girls, giving $\$2\frac{1}{2}$ to each except the last, who received what remained after the exact division. How many girls received $\$2\frac{1}{2}$?

17) How many pairs of slippers worth $\$1\frac{1}{4}$ can be bought with $\$8\frac{1}{2}$, and how much money will remain?

18) A carpenter built 9 rods of fence at the rate of $2\frac{1}{4}$ rods per day. How long did it take him?

19) Mary had $2\frac{3}{4}$ hours to spend on study. She gave $\frac{2}{3}$ hour to each study except the last, which received less time. How much time did the last study receive?

20) 6 yards of ribbon were used in some bows, only $\frac{2}{3}$ yard being in each bow. How many bows were made?

21) Anna bought $4\frac{1}{2}$ pounds of candy in a week, having bought only $\frac{3}{4}$ pound at a time. How many times did she purchase?

22) Mr. Jarvis planted $4\frac{4}{5}$ quarts of corn, dropping $1\frac{2}{3}$ quarts every hour. How many hours was he in dropping it all?

23) How many yards of ribbon worth $\$\frac{5}{8}$ per yard can be bought with $\$3\frac{1}{2}$?

24) At Christmas time Mr. Flynn gave away $9\frac{3}{4}$ bushels of sweet potatoes, giving $1\frac{1}{2}$ bushels to each family as far as possible. How much did the last family receive?

II. Second Case.

1. OBJECTIVE WORK.

(*a*) *Disks.*

Show two disks cut into fourths.

Show three-fourths of a disk.

In two disks how many fourths? Spread them out in a row. Find the three-fourths. What part of eight fourths are three fourths? $\frac{3}{4}$ is what part of 2?

Show three separate fourths of a disk. Show a half. Two fourths are what part of three fourths? $\frac{1}{2} \div \frac{3}{4} = ?$

Show four disks (cut into halves) and one half more. How many halves have you? Put enough halves together to make two disks. What part of nine halves ($4\frac{1}{2}$) are four halves (2)? $2 \div 4\frac{1}{2} = ?$

Show five separate sixths. Put together enough of these sixths to make $\frac{2}{3}$. What part of $\frac{5}{6}$ is $\frac{2}{3}$?

Cut one and one-third disks into sixths. Put together enough to make one-half. What part of eight sixths ($1\frac{1}{3}$) are three sixths? $1\frac{1}{3} \div \frac{1}{2} = ?$

Show three disks cut into thirds. Put together enough thirds to make one and two-thirds. What part of nine thirds (3) are five thirds ($1\frac{2}{3}$)? $3 \div 1\frac{2}{3} = ?$

(*b*) *Denominate numbers.*

1) Make on the blackboard a line four feet long. Mark off from one end three-fourths of a foot. Divide the whole line into fourths (of a foot). What part of four feet is three-fourths of a foot? $4 \div \frac{3}{4} = ?$

2) Measure $4\frac{1}{2}$ yards of tape. Mark a spot $1\frac{3}{4}$ yards from one end. Divide the whole piece into fourths (of a yard). What part of the whole piece is the part measured off ($1\frac{3}{4}$ yards)? $1\frac{3}{4} \div 4\frac{1}{2} = ?$

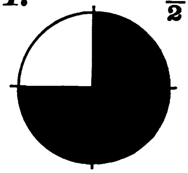
Etc.

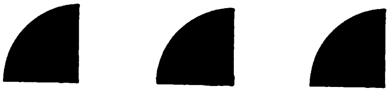
2. PICTURE WORK.

(*a*) ***Read:***

$\frac{1}{2}$ **is what part of** $\frac{3}{4}$ **?**

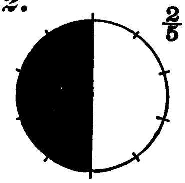
1. $\frac{1}{2} \div \frac{3}{4} = ?$

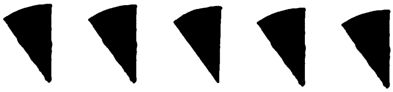




$\frac{2}{5}$ **is what part of** $\frac{1}{2}$ **?**

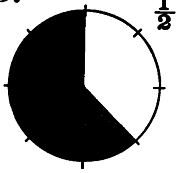
2. $\frac{2}{5} \div \frac{1}{2} = ?$

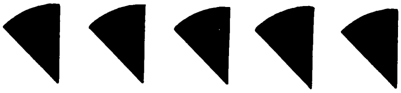




$\frac{1}{2}$ **is what part of** $\frac{5}{8}$ **?**

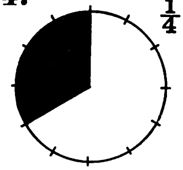
3. $\frac{1}{2} \div \frac{5}{8} = ?$

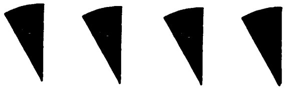




$\frac{1}{4}$ **is what part of** $\frac{1}{3}$ **?**

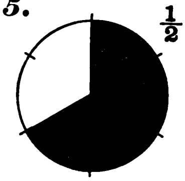
4. $\frac{1}{4} \div \frac{1}{3} = ?$

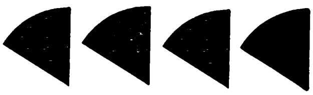




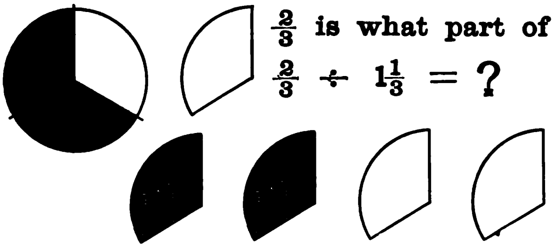
$\frac{1}{2}$ **is what part of** $\frac{2}{3}$ **?**

5. $\frac{1}{2} \div \frac{2}{3}$?





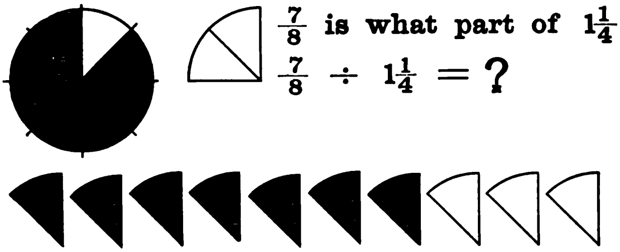
23.



$\frac{2}{3}$ **is what part of** $1\frac{1}{3}$ **?**

$\frac{2}{3} \div 1\frac{1}{3} = ?$

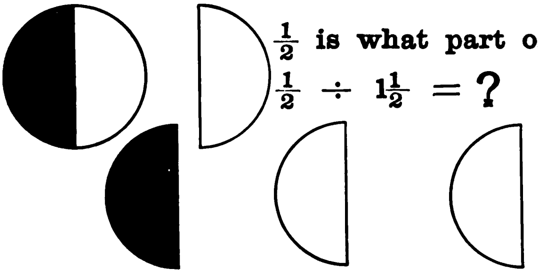
24.



$\frac{7}{8}$ **is what part of** $1\frac{1}{4}$ **?**

$\frac{7}{8} \div 1\frac{1}{4} = ?$

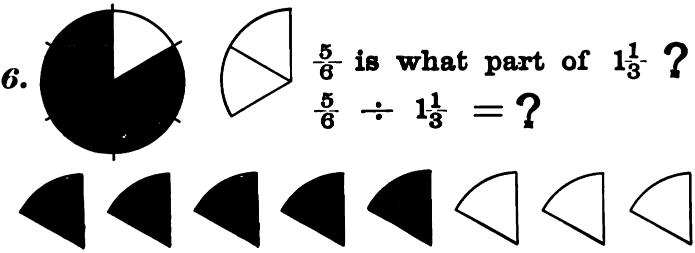
25.



$\frac{1}{2}$ **is what part of** $1\frac{1}{2}$ **?**

$\frac{1}{2} \div 1\frac{1}{2} = ?$

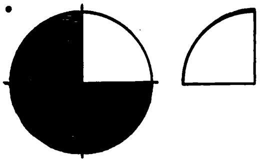
26.



$\frac{5}{6}$ **is what part of** $1\frac{1}{3}$ **?**

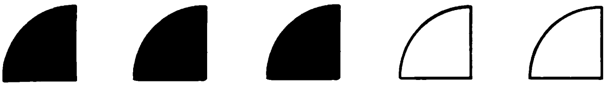
$\frac{5}{6} \div 1\frac{1}{3} = ?$

27.



$\frac{3}{4}$ is what part of $1\frac{1}{4}$?

$\frac{3}{4} \div 1\frac{1}{4} = ?$



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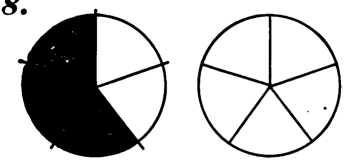
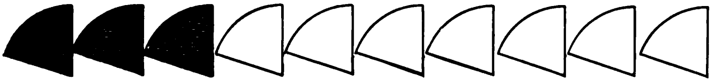


$\frac{3}{5}$ is what part of 2 ?

$\frac{3}{5} \div 2 = ?$



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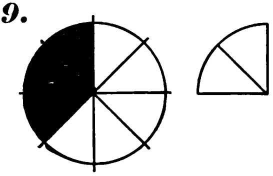
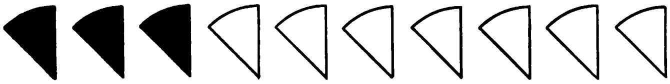


$\frac{3}{8}$ is what part of $1\frac{1}{4}$?

$\frac{3}{8} \div 1\frac{1}{4} = ?$



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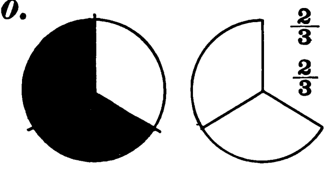
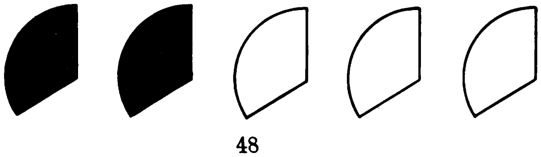


$\frac{2}{3}$ is what part of $1\frac{2}{3}$?

$\frac{2}{3} \div 1\frac{2}{3} = ?$



(*b*) *Illustrate:*

$\frac{3}{4}$ is what part of 3? $(\frac{3}{4} \div 3 = ?)$
$\frac{4}{5}$ is what part of 2? $(\frac{4}{5} \div 2 = ?)$
$\frac{3}{4}$ is what part of $\frac{7}{8}$? $(\frac{3}{4} \div \frac{7}{8} = ?)$
$\frac{1}{2}$ is what part of $\frac{2}{3}$? $(\frac{1}{2} \div \frac{2}{3} = ?)$
$1\frac{1}{2}$ is what part of $2\frac{3}{4}$? $(1\frac{1}{2} \div 2\frac{3}{4} = ?)$
Etc.

3. ABSTRACT WORK. MENTAL DRILL.

$\frac{3}{4} \div 2\frac{1}{4} =$
$\frac{1}{2} \div 1\frac{1}{2} =$
$\frac{3}{4} \div 1\frac{3}{4} =$
$\frac{1}{3} \div 1\frac{1}{3} =$
$\frac{2}{3} \div 1\frac{1}{3} =$
$\frac{5}{6} \div 1\frac{2}{3} =$
$\frac{5}{8} \div 1\frac{1}{4} =$
$\frac{2}{3} \div 2\frac{2}{3} =$

$\frac{1}{2} \div 2\frac{1}{2} =$
$\frac{3}{4} \div 1\frac{1}{4} =$
$\frac{3}{5} \div 2 =$
$\frac{1}{3} \div 1\frac{2}{3} =$
$\frac{7}{8} \div 1\frac{1}{4} =$
$\frac{2}{3} \div 2 =$
$\frac{2}{3} \div 1\frac{2}{3} =$
$\frac{2}{3} \div 2\frac{1}{3} =$

$\frac{1}{2} \div 3 =$
$\frac{1}{3} \div 1\frac{1}{3} =$
$\frac{2}{5} \div 2 =$
$\frac{5}{6} \div 1\frac{1}{3} =$
$\frac{3}{8} \div 1\frac{1}{4} =$
$\frac{3}{4} \div 2\frac{1}{2} =$
$\frac{3}{4} \div 2 =$

$\frac{1}{2} \div \frac{3}{4} =$
$\frac{1}{2} \div \frac{2}{3} =$
$\frac{5}{8} \div \frac{3}{4} =$
$\frac{1}{2} \div \frac{3}{5} =$
$\frac{5}{9} \div \frac{2}{3} =$
$\frac{1}{2} \div \frac{4}{5} =$
$\frac{1}{4} \div \frac{3}{8} =$
$\frac{1}{4} \div \frac{1}{2} =$

$\frac{2}{3} \div \frac{5}{6} =$
$\frac{1}{3} \div \frac{3}{4} =$
$\frac{3}{4} \div \frac{7}{8} =$
$\frac{3}{8} \div \frac{1}{2} =$
$\frac{3}{8} \div \frac{3}{4} =$
$\frac{1}{2} \div \frac{5}{6} =$
$\frac{1}{2} \div \frac{7}{8} =$

$\frac{4}{9} \div \frac{2}{3} =$
$\frac{2}{5} \div \frac{1}{2} =$
$\frac{1}{2} \div \frac{3}{5} =$
$\frac{2}{3} \div \frac{3}{4} =$
$\frac{1}{3} \div \frac{5}{6} =$
$\frac{1}{3} \div \frac{1}{2} =$
$\frac{1}{4} \div \frac{2}{3} =$

$1\frac{1}{2} \div 2\frac{1}{2} =$
$1\frac{1}{6} \div 1\frac{1}{3} =$
$1\frac{3}{8} \div 1\frac{1}{2} =$
$1\frac{1}{3} \div 1\frac{2}{3} =$
$1\frac{1}{2} \div 2\frac{3}{4} =$
$1\frac{1}{4} \div 2 =$
$1\frac{1}{4} \div 2\frac{1}{2} =$

$1\frac{2}{3} \div 2\frac{1}{3} =$
$1\frac{3}{4} \div 2\frac{1}{4} =$
$1\frac{3}{4} \div 2 =$
$1\frac{1}{6} \div 1\frac{2}{3} =$
$1\frac{1}{2} \div 3\frac{1}{2} =$
$1\frac{1}{8} \div 1\frac{1}{4} =$
$1\frac{1}{5} \div 2 =$

$1\frac{1}{4} \div 1\frac{1}{2} =$
$1\frac{1}{2} \div 4 =$
$1\frac{2}{3} \div 2\frac{2}{3} =$
$1\frac{3}{4} \div 2 =$
$1\frac{1}{2} \div 2 =$
$1\frac{1}{2} \div 4 =$

4. PROBLEMS.

1) Mrs. Blake has a half-dollar with which to buy cloth at $\$2\frac{1}{4}$ per yard. How much can she buy?
2) I put into a box capable of holding $3\frac{3}{5}$ pecks, $\frac{9}{10}$ of a peck of sawdust. How full was the box?
3) John has $\frac{3}{4}$ quart of nuts, and you have $2\frac{1}{2}$ quarts. What part of the quantity that you have has John?
4) Five and a half pints of ice-cream were eaten at a certain dinner. If each guest ate $\frac{3}{8}$ pint, what part of the entire quantity did he eat?
5) A fishing-party caught $10\frac{1}{3}$ pounds of perch. I caught 2 pounds. What part of the whole quantity did I catch?
6) Seven and a half yards of cloth were required for a certain suit of clothes. For the coat $3\frac{3}{8}$ yards were used. What part of the pattern was put into the coat?
7) One vase contains $\frac{1}{4}$ quart of water; another contains $\frac{5}{6}$ quart. What part of the capacity of the larger vase is that of the smaller?
8) A cow eats $\frac{7}{8}$ of a bushel of turnips in a week. What part of a week will $\frac{1}{2}$ bushel last her?
9) Mr. Tower earns $\$5\frac{4}{5}$ per day, and his son earns $\$2\frac{1}{2}$ per day. What part of their joint earnings does the son earn?
10) A book that sells for $\$4\frac{1}{2}$ cost to publish $\$2\frac{3}{4}$. What part of the cost of the book does the publisher gain?
11) In $7\frac{1}{3}$ pounds of so-called coffee, are only $2\frac{1}{6}$ pounds of true coffee. What part of the mixture is chiccory, etc.?
12) From a bag containing $4\frac{1}{4}$ bushels of corn, $2\frac{7}{8}$ bushels were removed. What part still remained?
13) I paid in New York $5 for a certain kind of glove,

and bought the same in Paris for $\$2\frac{4}{5}$. What part of the cost of the gloves did I save by buying in Paris?

14) A man buys $\$5\frac{1}{2}$ worth of goods for me and charges me $\$\frac{3}{4}$ for doing the business. What part of the cost of the goods do I pay him?

15) A lady "put up" $\frac{5}{6}$ gallon of quince preserves. $\frac{1}{3}$ of a gallon spoiled. What part of the preserves remained good?

16) James and Charles bought some writing-paper together. The package contains $\frac{7}{8}$ pound. James pays for $\frac{2}{3}$ pound. What part of the entire quantity does Charles pay for?

17) Mr. Bond ploughs $\frac{2}{7}$ of a certain garden in one day, and Mr. Payne ploughs $\frac{1}{2}$ of it in one day. What part of the work done by both men does Mr. Payne accomplish?

18) I buy $\$6\frac{2}{3}$ worth of goods and sell them for $4. What part of the cost of the goods do I lose?

19) For every $5 that my lawyer collects for me he saves out $\$\frac{1}{3}$ for doing the business. What part of the money that he collects does he receive for his services?

20) A coat that weighs $3\frac{1}{2}$ pounds contains only $\frac{1}{3}$ pound of wool. What part of the coat is wool?

21) When I sell $10 worth of furs for Mr. Jay, I receive $\$\frac{1}{2}$ for doing the business. What part of the selling price of the furs does Mr. Jay receive?

22) Fred owed me $\$\frac{9}{10}$. But he gave me a knife worth $\$\frac{1}{4}$. What part of the debt is still unpaid?

Note. *Written Work.* **Many simple examples are to be worked by the method used in objective work; that is, by reducing to a common denominator. Later, if it is thought necessary, attention may be drawn to the short method of inverting the divisor and then multiplying.**

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